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Research into nurse staffing levels in Wales

RESEARCH INTO NURSE STAFFING LEVELS IN WALES

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EXECUTIVE SUMMARY

In line with the project brief this report falls into two sections, namely: a critical examination of the evidence base associated with setting and monitoring safe nurse staffing levels followed by the presentation and analysis of findings related to developing a better understanding of the availability and accessibility of nurse staffing data in medical and surgical hospital wards in Wales. A summary of both of these sections is provided here with key points highlighted using italics and in bold within the main body of the report. Recommendations for practice and research emerging from these two sections are included within the executive summary, in addition to being presented at the end of the report.

Many of the project findings and recommendations fall into the theme of "Sensitivity to operations"; a term used by high reliability theorists to describe a workplace culture that permits early identification of problems so that actions can be taken before they threaten patient safety. Organisations and teams that exhibit sensitivity to operations deploy resources and have measurement systems in place that enable people to see what is happening and understand its significance and potential impact (Vincent, Burnett, & Carthey, 2014). The report attempts to move beyond a rather stagnant debate that only focuses on nurse staffing numbers or ratios towards a broader consideration of how hospitals and their largest workforce can improve care that patients receive.

1. To summarize the strengths and limitations of the evidence base associated with different approaches to setting and monitoring staffing levels.

The mandating of nurse-to-patient staffing ratios is a globally topical and contentious issue for healthcare organizations systems seeking to protect and enhance the quality of care, whilst facing increasing demand and the call for cost-effectiveness. In Wales this is also the case. What might be considered safe staffing levels is far from being a neutral issue, however, as professional, political, financial and moral agendas coalesce around the question of how many nurses are needed to provide safe, effective and humane health care.

The available published evidence on this topic was considered in some depth and, whilst increasing attention is undoubtedly being paid to the issue of safe nurse staffing, the nature of the research that has been (and can be) conducted fails to provide definitive "cause-effect" conclusions. In traditional measures of research, the randomised controlled trial (RCT) is favoured. In the topic of nurse staffing such an approach has not been possible, meaning that studies typically employ approaches that some may consider to be inferior in an attempt to better understand the association between nurse staffing and patient safety. Despite the lack of a 'magic bullet' study - to support or reject the case of minimum nursing ratios this does not mean that the available research should be discounted.

The conclusion we draw is that the available national and international sources of evidence can help inform the debate, whilst acknowledging its limitations and recognising its strengths and the lessons that can undoubtedly be applied to nursing in NHS Wales.

The lack of causal relationship between nurse staffing levels and patient safety outcomes often leads to the argument that there is insufficient evidence for the introduction of mandatory ratios or levels of staffing. However, the weight of evidence that suggest a positive association between higher levels of registered nurses working on wards and patient outcomes suggests that this argument could be turned on its head and that mandatory staffing ratios and levels should be introduced unless and until a causal relationship has been disproved.

Nevertheless, efforts to mandate staffing standards in other countries, such as the USA, through legislation have typically ended in contentious standoffs between nurses' unions and hospitals, tying the hands of legislators due to the varied agendas and the inability of nurses, hospital administrators and financial experts to move toward a single purpose. As a result methods for mandating nurse staffing in the USA through "Nurse Staffing Plans" appear to be moving away from legislation that introduces 'top-down', rigid nurse-to-patient ratios towards legislation that incorporates a more 'bottom-up' approach which incorporates nurses' and other professions' input to nurse staffing committees and, importantly, that draw directly on nurses' expertise and experiences to demonstrate the impact on nurse-sensitive patient outcomes. The Chief Nursing Officer for Wales staffing

principles appears to us to be a positive step in a similar direction, although in need of detailed evaluation.

We draw attention to the emergence out of conflict of consensus-based approaches to setting and monitoring staffing levels that involves nurses directly in agreeing a process to which they can contribute. This may reduce some of the 'heat' that currently surrounds the nurse staffing ratio debate which may be seen to provide more political, rather than practical, value at the present time for NHS Wales.

RECOMMENDATIONS FOR PRACTICE: Evolve the CNO's staffing principles along the lines of recent and promising innovations in nurse staffing methodologies in the USA, such as the Nurse Staffing Committees and Nurse Staffing Plans discussed in the evidence review. These move away from merely focusing on ward staffing in terms of numbers in isolation by embracing a more multi-disciplinary approach to staffing that empowers frontline nurses to participate in decision making about staffing levels and skill mix.

However, concern remains that if something as key as patient mortality is not reduced by increased nurse staffing then it must be something that the nurses do, that reduces mortality, leading some to conclude that determining what this is and how it can best be facilitated should be the goal of an effective patient safety strategy (and future research).

RECOMMENDATION FOR RESEARCH: More in-depth, rigorous qualitative studies of nurse staffing, ward staffing more generally and the availability of other resource such as equipment. A much richer, three dimensional sense of the world of nursing and healthcare work in NHS Wales can be achieved by asking the "why" and the "how", not just the "how many".

The dearth of robust health economics research into nurse staffing from the UK and internationally is also a significant gap in the literature, the absence of which further restricts a deeper understanding of the nurse staffing debate.

RECOMMENDATIONS FOR RESEARCH: Robust health economics analysis should, where relevant, feature routinely in the design of research studies into nurse staffing.

Importantly, the recent NICE indicators of nurse staffing ratios reflect the critique that the nurse/patient ratio effect on clinical outcomes - such as infections and mortality - are difficult to attribute to one professional group in isolation. Non-nursing healthcare professions have also expressed opinions; namely that legislating for minimum nurse staffing numbers could serve to reduce the numbers of Allied Health Professional posts, for example physiotherapy or occupational therapy. The effect of nurse staffing on patient outcomes is further complicated by other co-existing contextual factors such as vacancy rates, the quantity and quality of the environment or medical equipment or the extent to which professional development of staff is supported.

RECOMMENDATION FOR PRACTICE: The evidence review suggests that patient safety does not lie solely with the nursing workforce, but is also dependent on the support staff receive from organisations and the presence of other professionals and ancillary worker who provide critically important services. More regular, detailed and open publication of nurse staffing and broader NHS workforce data by NHS Wales is recommended by making better and fuller use of ESR-DW.

Another key challenge which researchers must face is the *inconsistencies in how variables were defined* and measured because researchers generally did not have flexibility to determine *what* is actually being measured. For example, although nurse staffing was often measured either as a nurse-to-patient ratio, the number of hours of nursing care provided during a defined time period, or a proportion of staff that consisted of registered nurses (skill mix) authors have *described up to 82 different measurements of nurse staffing* within these broad categories.

Researchers acknowledge that nursing work and patient outcomes co-exist with other factors within a complex system. However, researchers do not always confront this with studies continuing to be underdeveloped in terms of the absence of subtlety in methodological design to better understand such complexities.

RESEARCH RECOMMENDATION: Specifically in relation to this report a follow-up study is needed to revisit the data and work closely with LHBs, hospitals and individual wards to better inform a more complex understanding of some of the notable anomalies and points of curiosity within the data set such as the use of "flex" or "surge" beds and the inclusion of ward managers in ward staffing numbers.

The intended effect of introducing mandatory nurse staffing levels is obviously to improve patient safety outcomes, as well as a secondary gain in improving staff satisfaction. However, the literature suggests that mandatory staffing levels could result in more demand for nursing hours. Allied to a shortfall in nursing supply in some areas, poor rostering practices and inadequate workforce planning identified in inquiries into care failings such as the Keogh and Andrews Reports and large scale surveys of nursing staff, there exists a possibility that mandating such levels may well lead to unintended consequences, with existing nurses working longer hours to cover the expected increase in demand.

Thus what is intended to be a positive measure could become another problem in the making if adequate workforce and human resource planning in terms of recruitment and retention of nurses at a local and national level in Wales is not strategically addressed at the same time.

RESEARCH RECOMMENDATION: Further exploration is needed to better understand the effects of enhanced or reduced staffing levels on broader workforce factors such as staff wellbeing, staff retention and intention to leave. Opportunities exist here to bring together "big data" quantitative approaches and qualitative approaches that address questions related to these issues and safety outcomes.

2. To establish current and historical data that are available on nurse staffing levels in acute adult wards across Local Health Boards in Wales:

All staffing data originates within individual Welsh NHS Local Health Boards (LHB) and Trusts. *One key finding is that there is a worrying variety in terms of attempts at comparability and consistency of systems, processes and software packages used to capture and hold staffing information at the organizational level which have evolved locally, rather*

than nationally, to meet key operational needs - for example, Human Resources (HR), payroll, and workforce planning. Furthermore, little or no information on ward level nurse staffing is routinely published in a publicly available format.

The only way to access nurse staffing data at a ward level is via ad-hoc requests made directly to individual LHBs. This was the approach taken for this phase of the project. Within a limited timescale, but with researchers devoting considerable time to the project, it was possible to collect a large amount of data via this approach; namely staffing data from 181 individual medical and surgical ward areas from six LHBs. However, it is not clear how sustainable this approach to data collection would be on a more regular basis.

Under the current system of nurse staffing data management in Wales the *complexity and fidelity* of the staffing data accessible from outside the LHBs is progressively *reduced* to the point where nurse staffing data is available as annual figures produced by broad staffing groups, including grade and area of work at an organisational level.

RECOMMENDATION FOR PRACTICE: In line with Welsh Government's commitment to transparency and improved access to NHS information we recommend monthly reporting of detailed, accurate and robust ward level nurse staffing data across NHS Wales that is publically available. This recommendation will also bring NHS Wales in line with recent improvements in nurse staffing reporting elsewhere in the UK.

In addition, it was not possible to see staff by individual hospital or ward and no staffing data appear to be triangulated with patient safety outcomes or other related quality outcome metrics such as patient length of stay.

RECOMMENDATION FOR PRACTICE: The analogy of nurse staffing data as a "smoke alarm" is useful as it may provide an early indicator of patient safety problems. However, nurse staffing data are currently held and used as separate information sources by, for example, finance, human resources and nursing staff. These data sources should be linked and combined with "real time" ward information to form a "nurse staffing safety dashboard". Such a dashboard would prove a valuable resource from "hospital wards to boards" to anticipate and prepare for problems in a way that our experiences of data collection and analysis suggests is not the case at present (for example section 3.75).

Therefore proposals to legislate and monitor "safe nurse staffing" ratios or skill-mix appear premature given the current absence of a robust, centralised and linked data system for the accurate recording and reporting of nurse staffing and patient outcomes. Investment in data accuracy capture and analysis systems – as well as a review of data management infrastructure - should come before any attempt to mandate nurse staffing ratios. Focusing on infrastructure support to enable detailed and frequent analysis and report production may, in turn, indicate a specific need for future development and growth to support workforce intelligence for NHS Wales and Welsh Government.

Our data collection with LHBs revealed a variety of different definitions were in operation both within and across LHBs in Wales. One such example relates to the term "establishment" and "ward level establishment". The usefulness of a number of these definitions for making clinical decisions about safe nurse staffing on wards appears questionable as they seem to obfuscate rather than provide clarity for both researchers and those working closely in the NHS on the issue of nurse staffing.

This finding, whilst apparently fairly minor, reinforces the need for clarity and robustness when workforce data such as these are being collected. If minimum nurse staffing levels were introduced, and were then being monitored, this need would become even more important.

Data from a total of 181 individual acute medical and surgical ward areas when combined helped to produce a detailed picture of nurse staffing in Wales. Although we do not claim this to be an exhaustive data set of all medical and surgical wards in Wales we do believe this to be the largest collection of NHS Wales ward level nursing data in existence. *This indicates that a significant volume of nurse staffing data can be gathered in a fairly short time by researchers asking the right questions of the right people and that research into other areas of nursing practice is required.*

The number of beds present on each ward is an example of the nature of information requested. However, information such as bed numbers proved useful only to a point that led to more questions than answers being raised. For example, bed numbers demonstrated was that there was a considerable range with the largest ward being 5 times the size of the smallest (8 to 40 beds). The structure of the ward, such as bay size, whether there were

individual rooms, and so on, was not requested but are important factors that should be taken into account in future work; and especially when considering nurse to patient ratios and skill-mix. Bed numbers alone tell an incomplete story.

Our findings also provide an interesting insight into different shift patterns found at ward level. All the ward areas included in the report operated on a 24-hour basis. However, the way in which shift patterns are organised unsurprisingly varies across Wales, with combinations of early/mid/late shifts and short/long shifts for example. Furthermore, discussions with senior nurses revealed that nurses would sometimes work shifts of three to five hours in duration, to cover the busiest time of the day. It appears that regardless of whether there is a staffing shortage on a particular shift or not, some wards revealed **"***local agreements"* regarding Ward Sister/Charge Nurses being counted in the complete numbers, albeit only for some of the working week. *This raises a key issue about the adherence to the Chief Nursing Officer for Wales (CNO) staffing principles and to ratios more generally. The question might be asked whether a 1:7 Registered Nurse (RN)-to–patient ratio is likely to be consistently met throughout the day.*

RESEARCH RECOMMENDATION: More studies are needed on the relationship between nurse staffing levels, patient outcomes and patient acuity during times of the day, week and year.

Regardless of Welsh Government investment in nurse staffing and training places our data suggests that some wards routinely have lower numbers of nurses per shift than is desirable (for example section 3.78). However, medium to long term workforce planning in terms of LHBs in Wales tracking existing nurses' intention to leave, age profiles or forecasting expected numbers of newly graduating nurses joining the workforce appears to be mostly absent.

RESEARCH RECOMMENDATION: Enhancing data accuracy methods about the "churn rate" (a measure of the number of individuals moving out of a collective group over a specific period of time) of students and nurses and use of temporary staffing would help ensure greater political and public confidence that workforce investment strategies are increasing numbers of current numbers rather than merely replacing nursing staff that have left the NHS, or about to.

Numbers for agency and bank staffing were combined in the data request template so it was not possible to represent differences between these two types of staff. However on the census day (10th December 2014), 63 ward areas had temporary RNs, 89 ward areas had temporary HCSWs and 40 ward areas had both. Furthermore 136 ward areas had RNs vacancies and 73 had HCSW vacancies suggesting that even though there was a large use of temporary staff the need may be even greater. Annual temporary nurse staffing costs were reported by ward areas, totaling £13.5 million for bank and £5.5 million for agency staff.

RESEARCH RECOMMENDATION: Studies to better understand marked variation in temporary staffing usage on wards that are similarly staffed and face similar demands such as unfilled vacancy, patient acuity and turnover.

A further research recommendation related to temporary staffing suggests the need for:

RESEARCH RECOMMENDATION: Studies that better understand the motivation of nurses to work as temporary staff members and their experiences of temporary working. These can feed into strategies that may result in converting temporary staff to permanent staff whilst also better understanding how to get the best out of temporary staff who work for the NHS.

In summary the study met its brief by examining the available evidence base, reviewing its strengths and weaknesses, establishing the availability of data on nurse staffing levels and drawing conclusions about the quality and availability of these data. More in-depth discussion of the above will now be presented before concluding with recommendations.

GLOSSARY OF TERMS

Allied Health Professions (AHPs) The Allied health professions are a distinct group of healthcare professionals who apply their expertise to diagnose, treat and rehabilitate people of all ages and all specialties. AHPs are distinct from medicine, pharmacy and nursing and include professions such as physiotherapy, dietetics, speech and language therapy, occupational therapy, podiatry.

Bed Occupancy the number of hospital beds occupied by patients expressed as a percentage of the total beds available in the ward

Enrolled nurses Where present enrolled nurses provide care under the direction of a registered nurse.

Endogeneity Apparently contradictory findings in nurse staffing research such as the link between higher nurse staffing levels and higher rates of pressure ulcers, that could be accounted for by risk factors (such as acute illness, patient dependency), are instead causally linked with increased staffing levels. For example, some wards may get more staff because they care for a lot of patients at heightened risk of pressure ulcers

Establishment Can be presented or used in a variety of ways for specific situations or uses but generally refers to the number of staff needed to deliver services in an environment e.g. nurses on a ward.

Headcount This refers to the actual number of individuals working within an organisation and eliminates any double counting that may exist as a result of an employee holding more than one post. The headcount variable counts the employee only once and not, for example, under each organisation / region / specialty / grade they work.

Medical and Dental staff The medical and dental staff group includes: consultants, staff and associate specialist grades, doctors in training & other trained grades

Nursing, Midwifery & Health Visiting Staff These staff can be involved in the care for and treatment of patients and clients in a variety of health care settings

Nurse-to-patient ratio At a ward level this relates to the number of patients that a nurse would be caring for.

(Patient) acuity The measurement of the intensity of nursing care required by a patient. Generally the greater the acuity of the patient (and the complexity of their care) the larger the healthcare team needed.

Skill mix The combination or grouping of various categories of healthcare staff that have been employed to undertake service delivery.

Validity (external) The extent to which clinical research studies apply to broader populations.

Validity (internal) The extent to which the results of a clinical research study are not biased.

Whole time equivalent (WTE). WTE is derived by dividing the number of contracted hours by the number of hours worked. WTE can sometimes be a more useful measurement than headcount because it adjusts headcount figures to take account of part time working. Can also be referred to as full time equivalent (FTE) .

1. INTRODUCTION & BACKGROUND

Looking back upon his experience as a medical student and doctor Lewis Thomas wrote in *The Youngest Science,* that "hospitals are held together, glued together, enabled to function . . . by the nurses". Whilst on the one hand Thomas's observation that nurses are the glue that holds together healthcare teams and organisations has been reinforced by many and remains a largely unchallenged view to this day, the role of nursing and nurses in modern healthcare has recently come under severe focus.

One of the reasons for this focus is that the greatest running cost of the NHS is its workforce and nursing makes up the largest constituent part of this. At a time of severe financial austerity, therefore, it is unsurprising that the role of nursing is under scrutiny. Another reason is that over the last 40 years or so nursing's claim to expertise has been expressed in terms of its care-giving function. It is through its relationships with patients that modern day nursing is defined (Allen, 2015). Thus, as judicial, public and independent inquiries and government reports describe egregious care failings across the UK it is again unsurprising that serious questions are being raised about the association between nursing, nurse staffing levels and patient safety in particular. Whilst it is fair to say that such questions have consumed UK nurses and healthcare more generally for the last five years or so, similar questions for similar reasons have been asked elsewhere for longer.

Against this backdrop the objectives of the project, as per the tender document, are:

- To examine available evidence to develop an understanding of approaches taken to setting and monitoring nurse staffing levels in the UK and beyond;
- To summarise the strengths and limitations associated with different approaches to setting and monitoring staffing levels;
- To establish current and historical data that are available on nurse staffing levels in adult acute wards across Local Health Boards in Wales; and
- To analyse these data in order to produce evidence of current staffing levels by Local Health Board and nationally, along with historical trends where possible at national and Local Health Board levels.

The report is ordered accordingly, with a rapid appraisal of research undertaken in the area of nurse staffing, especially with a focus on patient safety outcomes, preceding results from data collection and analysis of nurse staffing on hospital medical and surgical wards from across Wales.

2. RAPID EVIDENCE APPRAISAL

The aim of this rapid evidence appraisal (REA) is not to review everything that has ever been published about "safe nurse staffing levels". Instead we have favoured sense-making over cataloguing, seeing the primary task of the REA as teasing out the meaning and significance of the most important literature (see Box 2.1). Following the rationale of Greenhalgh, Potts, Wong, Bark, & Swinglehurst (2009) we undertook the review in this way for the following reasons: first, comprehensive reviews and a meta-analysis of the literature have been produced in several papers which we will cover in depth; second, we did not have the resources (largely time) for a more exhaustive search of all relevant fields; and third, we considered that making sense of the literature was a worthy goal in its own right. A fuller description of the search strategy and review process is provided in Annex 1.

Box 2.1: Rapid evidence appraisal : overview of search results	
Literature search and retrieval	**Review of research:** 123 papers returned – 36 papers excluded, leaving 87 to review. All papers read and critiqued, preliminary themes mapped. **Review of grey literature & policy**: Most of 36 excluded papers added to grey literature collection consisting of journal articles, government reports and material from healthcare related organizations such as trades union and professional journals such as the Nursing Standard.

2.1 Approaches to setting and monitoring nurse staffing levels in the UK and beyond

2.1.1 Nurse-to-patient ratios and skill mix

Nurse-to-patient ratios set the maximum number of patients that may be assigned to a nurse during one shift. When the nurse-to-patient ratio is high it means that one nurse has a relatively high number of patients to take care for, and when the nurse-to-patient ratio is low it means conversely that one nurse has responsibility for a relatively low number of patients.

Some describe moves towards nurse to patient ratios as perpetuating a myth that "a nurse is a nurse" by failing to account for differences in nurses' skill levels and expertise as well as hospital resources and other support for nursing care (Manojlovich, 2009). For example, additional nurse staffing-related characteristics that are often overlooked when nursing ratios are discussed include (amongst other things) the qualifications of the staff members, years of experience, the use of contract or agency staff and whether or not the ward

manager and student nurses who are not usually assigned a patient load are sometimes included in the staffing measure (see section 3.78 for similar reflections on the data collected for this project). There is also a tendency to somewhat simplistically homogenise patients too with the assumption being made that patients classified in the same category (e.g. medical or surgical) can be grouped and cared for with the same level and types of resources. For example, there is a danger that when setting a 1:7 nurse-to-patient ratio this implies that the ratio of nurses is sufficient to ensure high quality and safe patient care for all types of surgical patients in every hospital. If such decisions are based on a flawed understanding of nurses and nursing work, the consequences can be serious.

Although much advice has circulated regarding nurse-to-patient staffing ratios, such as those circulated by the CNO for Wales and the National Institute for Health and Care Excellence (NICE), organisations may well be operating with different understanding of ratios, for example whether ratios are for full time equivalents of registered nurses (RN) per patient day or occupied bed, or patient-to-nurse ratio per shift, as described in a review of literature (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007a) and found during our data analysis (see section 3). As will be discussed at length elsewhere in the review, countries that have set minimum nurse-to-patient ratios on hospital wards have reported an uplift in the numbers of nurses working on wards. However, the answer to questions such as whether these increases in nursing personnel have resulted in reductions of other employees or in improved patient outcomes remains elusive.

The need for an appropriate skill mix among nursing staff has also been widely emphasised. For example, in 2006, the Royal College of Nursing recommended that a skill mix ratio of 65 per cent registered nurses to 35 per cent healthcare support workers (HCSW) should be regarded as the benchmark in acute ward areas. In 2012 guidance from the CNO for Wales (National Assembly for Wales, 2013) set out that the skill mix of RNs to support workers in acute areas should generally be 60:40. The limitations with setting RN to HCSW ratios are the same as described above in the discussion of nurse to patient ratios. The findings, strengths and limitations associated with skill mix ratios are discussed throughout the following evidence review sections, while insights from data collected from wards across Wales are discussed in section 3.

2.1.2 Nurse staffing committees and staffing plans

Following California becoming the first state in the USA to pass legislation mandating licensed nurse–patient ratios for units in acute-care hospitals, calls for mandated ratios have grown across the U.S.A and beyond. Yet efforts to mandate staffing standards through legislation have typically ended in contentious standoffs between nurses' unions and hospitals, tying the hands of legislators due to the varied agendas and the inability of nurses, hospital administrators, and financial experts to communicate to achieve a single purpose. For example, until 2008 Washington State legislature was the scene of many battles over staffing legislation, with a new staffing bill being introduced annually resulting in the polarisation of nurses, hospitals and politicians and leading to stalemate in the legislature (Robert Wood Johnson Foundation, 2014).

Several protracted stalemates finally led to mediation, which provided an innovative nurse staffing solution. The solution did not result in a mandatory nurse-to-patient ratio but instead an agreement and supporting legislation (House Bill 3123) was reached by all parties for nurse staffing in Washington State hospitals to be overseen by nurse staffing committees (see Box 2.2).

Box 2.2: Highlights of the Washington State Safe Nurse Staffing Legislation (House Bill 3123):

- Each hospital must establish a nurse staffing committee composed of at least half direct care nurses. This committee will develop, oversee and evaluate a nurse staffing plan for each unit and shift of the hospital based on patient care needs, appropriate skill mix of registered nurses and other nursing personnel, layout of the unit, and national standards/ recommendations on nurse staffing.
- If the staffing plan developed by the staffing committee is not adopted by the hospital, the CEO must provide a written explanation of the reasons why to the committee.
- The staffing information must be posted in a public area and must include the nurse staffing plan and the nurse staffing schedule, as well as the clinical staffing relevant to that unit. It must be updated at least once every shift and made available to patients and visitors upon request.

Anecdotal evidence suggests that the introduction of staffing committees has proved popular with nurses and managers, as they provide nurses with a channel for communicating their bedside knowledge that helps hospitals to plan safe staffing levels (Robert Wood Johnson Foundation, 2014). As a result, methods for mandating nurse staffing in the **USA appear to be moving away from legislation that introduces 'top-down', rigid nurse-to-patient ratios towards legislation that incorporates a more 'bottom-up' approach** which obtains nurses' input to nurse staffing committees and plans, that draw directly on nurses' experiences and are based on nurse-sensitive patient outcomes (see section 2.2.3 for more on these outcomes).

The position advocated by those in favour of nurse staffing committees and plans is best captured by the following quotation:

> 'Whatever solution we stand behind must give the nurse the power to make staffing decisions and to override models, including ratios, when they don't make sense and to have the authority to use their expertise in the best interest of patients, the care team, and the hospital' (Douglas, 2010).

Staffing committees across the USA therefore ratify and publish mandatory staffing plans. Each staffing plan, however, is structured differently across states and organisations and typically requires the development of a predetermined strategy to address staff shortages as they occur. In contrast to mandatory staffing ratios, all mandatory staffing plans are typically developed at the organizational and unit level using a **shared governance model with dialogue and decision-making authority delegated to both staff nurses and nursing leadership.**

Few in-depth studies of staffing committees or staffing plans exist, with one exception being an evaluation which found that mandatory staffing plans facilitate intraorganisational communication and shared governance in the development of plans to address staffing shortages (Cox, Anderson, Teasley, Sexton, & Carroll, 2005). They conclude that the initial focus of those wishing to legislate for nurse staffing levels should be on the adoption of mandatory staffing plans, before looking at mandatory staffing ratios. Similarly, Upenieks, Kotlerman, Akhavan, Esser, & Ngo's (2007) evaluation of the introduction of nurse-to-patient ratios in California supports nurse staffing plans as they encourage more

accountability at a hospital management level, rather than having mandated nurse-to-patient ratios that mean 'hospitals will simply staff the minimum required numbers' (p.18).

It is interesting for us to note that some of the elements within the staffing committee approach are present in the CNO's staffing principles (National Assembly for Wales 2013), such as the recommendation for professional judgement throughout the staffing process. It appears, therefore, that some of the current Wales staffing principles are in tune with recent and innovative changes in the USA that have appeared due to disaffection with the imposition of rigid nurse to patient ratios.

In the **USA** more generally a plethora of approaches to nurse staffing levels has emerged as The Registered Nurse Staffing Act of 2013 (Capps, 2013) mandates individual states legislatures to ensure that staffing is appropriate to meet patients' needs safely. As a result, state staffing laws tend to fall into one of three general approaches:

- To require hospitals to have a nurse-driven **staffing committee** which create staffing plans that reflect the needs of the patient population and match the skills and experience of the staff. Establishing minimum upwardly adjustable staffing levels in statute may aid committees to achieve safe and appropriate staffing plans.
- For legislators to **mandate specific nurse to patient ratios** in legislation or regulation.
- To require facilities to **disclose** staffing levels to the public and /or a regulatory body.

For example, seven states in the USA now require hospitals to have staffing committees responsible for plans and staffing policy: Illinois; Nevada; Ohio; Texas; Oregon; Washington State; and Connecticut. California is the only state that stipulates in law and regulations that minimum licensed[1] nurse-to-patient ratios be maintained at all times in a variety of clinical settings such as critical care, surgical services, labour and delivery suites and paediatric services. In medical and surgical wards the licensed nurse-to-patient ratio is 1:5 or fewer at all time (California Department of Public Health, 2015).

[1] In California the term "licensed nurse" means a registered nurse, licensed vocational nurse and, in psychiatric units only, a licensed psychiatric technician.

In addition, five states require some form of disclosure and/ or public reporting, namely Illinois, New Jersey, New York, Rhode Island and Vermont. Interestingly, the Maine state legislature enacted minimum staffing ratio requirements based on patient acuity, but removed this legislative requirement in 2004, prior to implementation. The Maine Quality Forum Advisory Board stated there was no scientific evidence that showed mandated nurse-to-patient ratios guaranteed quality and safety in patient care in acute care hospitals (White, 2006).

Various approaches towards mandating nurse staffing levels have been undertaken by other countries, some of which are summarized in table 2.1. It is, however, important to note that the published research which evaluates these approaches is mostly limited to the USA (California in particular) and more recently Australia, with little research from other countries that have attempted to mandate nurse staffing levels such as South Korea or Israel.

The view internationally that emerges from the limited geographical coverage of research studies and commentaries (e.g. Griffiths, 2009; Hertel, 2012) in nursing journals appears to be that it is impossible and even undesirable for a single, constant nurse-to-patient ratio to be mandated for across all medical and surgical wards. Instead a more nuanced approach has been developed that seeks to embed staffing principles within the context of nursing requirements. Recent guidelines for nurse staffing in hospitals in Wales (National Assembly for Wales 2013) and England (NICE, 2014) support a flexible approach to setting nurse staffing levels, whilst also reinforcing the point that there is evidence of increased risk of harm associated with a registered nurse caring for more than 8 patients during day shifts.

Table 2.1: Examples of nurse staffing level approaches from other countries.		
Country	Regulation /law	Evaluation
Israel	Several failed and abandoned approaches to standardize nurse staffing arrangements since 1974. Currently a number of RN to support worker ratios for a variety of clinical areas are recommended by the Directors of Nursing Commission (2005) including: 80:20 for complex surgery; 70:30 for less complex surgery; 85:15 for nephrology; 70:30 for internal medicine.	No formal evaluation to date (see Rassin & Silner, 2007 for further details)
South Korea	1962 – law to enforce a prescribed number of hospital nurses, overall a ratio at hospital level of 2.5 patients for 1 nurse. 1999 – regulation regarding hospital payments required hospitals to report nurse to patient staffing levels in relation to the 1962 law.	1962 law – 9.2% of medical institutions compliant in 2010. Only 17 hospitals (9.2%) achieved the government recommended staffing levels (Yu & Kim, 2013)
Victoria, Western Australia, New South Wales, Australia	2001 – Victoria, followed by Western Australia and New South Wales, mandated several different ratios depending on patient acuity and care environment and across shifts (am shift, pm shift and nights). General medical-surgical wards include ratios of 1:4 to 1:6 on am and pm shifts and 1:8 to 1:10 on night shifts. There is a degree of flexibility allowed but the 5:20 rule applies, where there is a minimum of 5 nurses to 20 patients at all times.	Western Australia - significant improvements in patient outcomes associated with implementation of changes including mortality, pressure ulcers and average length of stay amongst others. (Twigg, Duffield, Bremner, Rapley, & Finn, 2011)

2.2 The role played by nurse staffing levels in influencing patient safety

A considerable volume of evidence clearly suggests that **higher nurse staffing levels are positively associated with safer patient care**. However, as the next section will cover in more depth, while all of these studies can demonstrate associations, they **cannot establish clear causal relations**. The inability to attribute a cause-effect relationship between nurse

staffing numbers and patient safety outcomes has been identified in several high-quality systematic reviews (Griffiths, Ball, et al., 2014; Kane, Shamliyan, Mueller, Duval, & Wilt, 2007b; Lankshear, Sheldon, & Maynard, 2005).

Thus Kane and colleagues (2007b: 97), concluded in their systematic review that:

> *Taken as a whole, there is consistent evidence of an association between the level of nurse staffing and patient outcomes but no clear case for causation. The nature of the study designs precludes any efforts to establish a causal relationship. There are no interventions, let alone controlled trials. The effect on quality of other salient input, such as medical care, is not tested*

As a result of the limitations of the research, Griffiths and colleagues (2014: 12), in their systematic review for NICE, concluded:

> *The diverse evidence base in terms of contexts, outcomes, measures of staffing and methods of analysis renders any attempt to directly derive safe staffing levels that could apply to the NHS context from this research, premature.*

2.2.1 Nurse staffing and patient safety outcomes

Nurses are present on hospital wards twenty-four hours a day, seven days a week and are consequently in an ideal position to detect changes in the patient at an early stage and identify errors which may lead to avoidable harm; critical functions for ensuring the quality of patient outcomes. Several patient outcomes have been researched in relation to nurse staffing, most of which are listed in box 2.2. Higher nurse staffing levels and a skill mix consisting of a higher proportion of RN hours have been associated with a **decrease in adverse patient outcomes** in many studies and evidence overviews (for example Kane et al., 2007a,b; Rafferty et al.,2007; Aiken et al., 2010). However, there are inconsistencies in the evidence as not all studies show an association, with a number of studies not able to demonstrate that improved nurse-to-patient ratios positively impact on the quality of patient care (Van den Heede et al., 2009; Twigg, Geelhoed, Bremner, & Duffield, 2013; Griffiths, Ball, et al., 2014).

The **hospital is the unit of analysis** in most of these studies, with data being retrieved from large administrative datasets. Staffing levels/skill mix and patient outcomes are averaged over the whole hospital, thus smoothing out variability resulting in a loss of detail. Although these studies provide high external validity **it is impossible to detect variations at ward level** or investigate the context of care (Twigg, Gelder, & Myers, 2015). A smaller number of studies do use the **ward as the unit of analysis**, allowing for more detailed **analysis of the context** of care (Bowers & Crowder, 2012; Duffield, Roche, Dimitrelis, Homer, & Buchan, 2014), although these type of studies may not account for patient movement between wards during their hospital stay, making it difficult to attribute outcomes to a particular unit. However, no studies have explored whether there are marked differences in, for example, patient outcomes at these different levels of analysis.

Box 2.3: Patient safety outcomes studied in relation to nurse staffing.

Mortality, deep vein thrombosis (DVT), cardiac arrest, hospital acquired pneumonia, hospital acquired sepsis, falls, pressure ulcers, "failure to rescue" (defined as the probability of death after a complication), length of stay, readmissions, other infections (such as catheter-acquired infections, surgical site infections).

One of the outcomes most commonly reported is **mortality,** where evidence from large observational studies of good quality (strong internal validity) and several high-quality systematic and meta-analytic reviews suggest that hospital areas with higher nurse staffing have lower rates of mortality (Griffiths et al 2014a). However, concern remains that mortality is not reduced by increased nurse staffing but by something that the nurses do, leading Shekelle (2013) to conclude his systematic review with a recommendation that determining what this is and how it can best be facilitated should be the goal of an effective patient safety strategy. It is also likely that mortality (and the other patient outcomes identified in Box 2.3) are substantially influenced by other staff groups. Thus while **mortality rates may be an indicator of nurse staffing problems it cannot be presented as a specific indicator**.

According to the review conclusions recently published by Griffiths et al (2014a) other **promising** indicators of safe staffing (in terms of robust research design that allow some confidence in attributing association between higher numbers of nurses and avoidance of

adverse events) include **falls, medication administration errors** and **missed nursing care**. Additionally, occurrence of **pressure ulcers** and **infections** have also been identified as being associated with nurse staffing levels although direct comparisons between units or wards are **unlikely to be valid**. However, the evidence in terms of **pressure ulcers is mixed**, with some studies finding significant negative associations between staffing levels and pressure ulcers (i.e. lower staffing associated with lower rates of ulcers), while others found a significant association in the opposite direction. The lack of research that seeks to further explore variation in the effects of nurse numbers on patient outcomes is a significant gap in the literature. The context of care, including the presence or absence of other members of the multi-disciplinary team or items of equipment could explain variation in findings. Additionally, as Griffiths and colleagues (2014) conclude in their review, while the evidence of the association between lower levels of nurse staffing and **falls**, higher rates of **medication administration error** and **missed nursing care**, including paperwork appears robust, methods for determining these outcomes are underdeveloped and may lead to anomalies in the research findings reported.

Most research in this field has focused on RNs and patient outcomes e.g. the ratio of RNs to patients. However, RNs are not the only group delivering nursing care, as unregistered **HCSWs** also deliver care under the supervision of RNs. There has been understandable interest in the question regarding the extent to which HCSWs can safely substitute for RNs, although studies directly examining the RN/HCSW "skill mix" are not common. While evidence is not always strong in those studies that have been undertaken, RNs appear to contribute significantly to the safety of patient care in hospitals, given that **no evidence exists to support a positive role of HCSW in patient safety outcomes** and patient experience, although some evidence points toward negative associations (Griffiths et al 2014). Some studies point to a **negative association** between HCSWs and outcomes such as higher rates of falls (e.g. Hart & Davis, 2011) and pressure ulcers (e.g. Seago, Williamson, & Atwood, 2006) which has obvious implications on discussions around RN:HCSW skill-mix and role substitution, a term which refers to where certain roles and tasks traditionally undertaken by RNs are taken-over by HCSWs.

2.2.2 Nurse staffing and patient safety research from the UK

Notable studies that provide specific information on levels of staffing **in UK hospitals** are rare within the literature. Those in existence primarily report on research undertaken in England (Rafferty et al., 2007; Shuldham, Parkin, Firouzi, Roughton, & Lau-Walker, 2009; Ball, Pike, Griffiths, Rafferty, & Murrells, 2012; Ball, Murrells, Rafferty, Morrow, & Griffiths, 2014) with one study reporting on data collected in England and Scotland with the potentially misleading title referring to 'UK hospital nurse staffing' (Sheward, Hunt, Hagen, Macleod, & Ball, 2005).

Rafferty et al (2007) gathered data from 30 trusts in England consisting of discharge abstracts of general, orthopedic and vascular surgery patients (n = 118, 752) combined with self-administered postal surveys from nurses (n = 3984, 49.4% response rate) involved in direct patient care. It is important to note the eight-year gap between data collection and publication, which means the results being reported are for a period of time between **April and July 1999**. There have been significant changes within nursing and across healthcare in the intervening time, including the phasing out of enrolled nurses (ENs) who are included in the study sample, and the fact only 8% of respondents held a degree or higher degree (compared to 28% (range 10-49%) with degrees in nursing reported by Ball et al., 2012).

As is the case with other large observational and notable studies in this area (such as Aiken et al., 2012) the numbers of nursing staff on duty, the numbers of total patients on the ward and numbers of patients assigned to individual nurses reported by Rafferty et al are based on the nurses' **recall of the most recent shift worked**. The mean of all patient loads of all RNs (and Enrolled Nurses in this study) carrying at least one patient was used to derive a hospital-specific aggregate staffing measure. Rafferty and colleagues explain that this staffing measure is often reported as superior to those derived from administrative databases because it included only those nurses who had a direct clinical role. However, there are limitations to this approach.

For example, survey responses relied on RNs accurately reporting patient numbers for the whole ward; total numbers of nurses on the ward and the allocation of patients they cared for on the most recent shift. Whilst we would expect nurses to **accurately recall** their own patient allocation, it may be more problematic for nurses to accurately recall total number

of patients on the ward, and to a lesser degree the numbers of nurses. Nurses responding to the survey also worked in **markedly diverse clinical areas**, such as accident and emergency units (A&E), intensive care wards and medical-surgical units and the survey only included full-time nurses. It is also unclear at **what time of day** patient and nurse numbers were to be counted, or whether maximum or minimum numbers of patients cared for were counted. For example, the numbers of patients requiring direct care from RNs **naturally fluctuate** during the course of the day and week in A&E units. Similarly, in surgical areas, patients allocated to nurses are absent from wards for sometimes lengthy periods for surgery or other interventions.

The study reported that patients and nurses with the most favourable staffing levels (lowest patient-to-nurse ratios) had consistently better outcomes than those in hospitals with less favourable staffing. For example, **mortality was 26%** higher on wards where nurse-to-patient ratios where higher (12.4-14.3 patients to nurses) compared to those with the lowest ratios (6.9-8.3 patients per nurse). However, how the rate of mortality was measured was not reported e.g. whether it was risk-adjusted mortality in hospital within 30 days of admission as is often used by others (e.g. Aiken et al., 2014), or on discharge which is less common but used nonetheless (Penoyer, 2010).

The RN4Cast study consisting of data from a consortium of 15 countries (the English survey findings reported in Ball et al., 2012) built on some aspects of the previous research published by Rafferty et al (2007). On average Ball and colleagues (2012) reported that each RN cared for 8.0 patients during the day and 10.8 patients at night. However, the averages mask 'substantial variation' (p.9) within and between research sites, varying from 5.2 patients per RN at one site compared to 10.9 at the lowest end of nurse-to-patient ratio at another. There were also marked differences between medical and surgical areas, with nurses on medical wards typically caring for two patients more than on surgical wards.

The mortality outcomes from RN4Cast for surgical patients only, aggregated across nine of the 12 countries, including England, were recently reported (Aiken et al., 2014). After adjusting for severity of patients' illness and characteristics of hospitals (teaching status and technology) both **nurse staffing level and nurse education levels were significantly associated with mortality.** The results suggested that an increase of one patient per nurse

is associated with a 7% increase in the likelihood of a patient's dying within 30 days of admission. Similarly, each 10% increase of bachelor's degree nurses was associated with a 7% decrease in this likelihood.

Box 2.4: Staffing and education levels of nurses and mortality (from Aiken et al 2014: 1827)

These associations (between education and staffing numbers) suggest that patients in hospitals in which 60% of the nurses had bachelor's degrees and nurses cared for an average of six patients would have almost **30% lower mortality** than patients in hospitals in which only 30% of the nurses had bachelor's degrees and nurses cared for an average of 8 patients.

There are increasing numbers of individual studies from Europe, as well as large cross-Europe studies, that make comparisons between these countries reasonable (Aiken et al., 2012). However, the majority of studies reviewed are from the USA and comparisons of similarities and differences as well as the generalizability of findings between **UK and US nurse staffing research** should be tentative at best. Even within a study that reported findings from both the USA and countries across Europe (Aiken et al., 2012) it was reinforced that interpretation of any differences between countries should be **'made cautiously, if at all'** (p.5). This call for caution is made particularly relevant given that, in lieu of UK research findings, it is inevitable that non-UK research findings are used in the increasingly frequent debates about nurse staffing.

A further paper drawing on the RN4Cast project (Ball et al., 2014) focuses on unfinished or **'missed care'** reported by **2917 nurses (RNs and HCSWs) on 401 medical and surgical wards in England** (defined as 'care that nurses regard as necessary but was left undone on their last shift due to lack of time' p. 117), including its nature and prevalence and any relationship between nursing care left undone and ward nurse staffing levels. A majority of respondents (86%) reported that one or more care activity had been left undone due to lack of time on their last shift, with nurses missing a mean of four items of care and more care being missed on day and afternoon shifts compared to night shifts.

Talking with or comforting patients, adequate patient surveillance and adequate patient documentation were the tasks most frequently left undone that were associated with

nurse staffing. For example, nurses working on shifts with the worst staffing (11.67 patients per RN) were twice as likely to report inadequate patient surveillance when compared with those in the best staffed environment (less than 6.14 patients per RN).

However, the mean number of activities left undone varied significantly between wards rated by staff as 'failing' on patient safety (7.8 activities per shift left undone), compared to wards where patient safety was rated as excellent (2.4 activities undone). The numbers of patients per RN was also significantly associated with reports of missed care ($p<0.001$) although numbers of HCSWs were not found to be associated with either the amount of missed care or the occurrence of any missed care reported by RNs ($p<0.05$).

As Ball and colleagues (2014) noted, the measure of missed care is open to subjective experiences of individual nurses who may have understood specific items differently, such as the term 'adequate patient surveillance'. Differences were also possible in expectations and perceptions of what level of care was needed by patients and whether care was provided or not, or left undone due to time constraints. It is also unknown whether responsibility for care that was left undone was handed over and completed by another nurse on a different shift. Additionally, neither the grade-mix of nursing staff (for RNs or HCSWs) nor the level of temporary staffing (bank and agency nurses) that were on duty were known, both of which could affect the productivity of a ward and the amount of work left undone. The authors concluded that a 'missed care measure' (Ball et al., 2014: 123) may be a useful correlate of nurse care quality which can inform staffing decisions at ward level.

The next section focuses in more detail on the development of so-called nurse-sensitive indicators of patient outcomes.

2.2.3 Nurse-sensitive patient safety outcomes.

It could (or should) be argued that efforts demonstrating RN-sensitive outcomes can be traced back to Florence Nightingale's groundbreaking data collection on mortality statistics and preventable deaths from infections in the field hospitals of Scudari during the Crimean War (1854-1856). However, it is only during the last fifteen years or so that increased focus has been brought to bear on attempting to better understand the contribution of nurse

staffing and skill mix to ensure the quality and safety of patient care.

The earliest large study of patient outcomes that are 'sensitive to the extent or quality of nursing care' by (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002) has been heavily cited (792 citations) and initiated a raft of studies in the USA and later globally that attempted to develop and refine Nurse Sensitive Outcomes (NSO) as a means of contributing better understanding to the question of the levels of nurse staffing required on hospital wards. The research featured in the previous section on "Nurse Staffing and Patient Safety Outcomes" has contributed greatly to the development of NSOs, defined as 'patient or family caregiver states, behaviours, or perceptions that are responsive to nursing intervention' (Maas et al. 1996, p. 296).

More recently the terms Safe Nursing Indicators (SNIs) and Nurse Sensitive Indicators (NSIs) have been introduced in England (The Shelford Group, 2013[2]; NICE, 2014). These terms appear to share the same definition as given above for NSOs, but are different with respect to the detail of which outcomes or measures should be considered to be an indicator, or not (see table 2.2 below). It is evident from table 2.2 that there is currently no consensus on what constitutes a nurse-sensitive outcome with **only pressure ulcers appearing across all three studies** as an indicator. This is interesting given that the evidence for a link between nurse staffing and pressure ulcers is mixed and contradictory. **Despite more than a decade of research being completed, the translation of research findings into evidence-based recommendations regarding nurse sensitive outcomes remains a challenge**.

It is also evident that the NICE guidelines introduce a broader range of indicators than those suggested by others. For example, Needleman(2002) focuses on outcomes that are measured as biomedical 'complications' or adverse events, with only one care process measure (length of stay), whereas The Shelford Group introduces a mix of adverse e.g. infections, slips and falls and process issues such as complaints relating to communication and attitude of nurses. The NICE indicators, however, reflect the critique

[2] The Shelford Group is an organization comprising the Chief Executives of ten of the leading NHS multi-specialty academic healthcare organizations in England http://shelfordgroup.org/

Table 2.2: Comparison of nurse sensitive outcomes or indicators.

	Nurse-sensitive outcomes (Needleman 2002)	Safe nursing indicators - each measured by rate per 1000 occupied bed days (The Shelford Group 2013)	Nurse sensitive indicators (NICE 2014)
Areas of commonality	**Pressure ulcers**, Deep vein thrombosis	**Pressure Ulcers** - incidence of hospital acquired pressure ulcers	**Pressure ulcers**
		Slips, Trips & Falls – number of slips, trips or falls per caused primarily by nursing error.	**Falls**
		Drug Errors – actual drug errors where nursing was the primary cause, not including near misses	**Medication administration errors**
	Hospital acquired pneumonia Hospital acquired **sepsis** Urinary tract **infection** Wound **infections**	**Infection-** incidence rates of MRSA bacteraemia and *Clostridium Difficile*	
Other areas	- Central nervous system complications. - Upper gastrointestinal bleeding - Shock/cardiac arrest - Failure to rescue - Metabolic derangement - Pulmonary failure - Mortality - Length of stay	- Official complaints about nursing/midwifery/care staff received identifying the 3 areas of: Communication, Clinical Care and Attitude - Nutrition - number of patients having had nutritional screening. Percentage of wards that have implemented protected mealtimes policy.	- Missed breaks - Nursing overtime - Required and available nurses for each shift - High levels and/or ongoing reliance on temporary nursing - Compliance with any mandatory training

(covered elsewhere in this report) that the effect on outcomes such as infections and events mortality are difficult to attribute to one professional group in isolation. It is interesting that The Shelford Group indicators appear to acknowledge, but then overlook, this critique when suggesting that drug errors and slips/falls **caused primarily by nursing** error be included. The words 'caused primarily' suggest an understanding that the actions of more than one professional or staff group can contribute to adverse events, although it is difficult then to understand how 'primary causation' can be attributed to one group or the other, given the lack of evidence to support a single responsible group for most patient outcomes. The group's insistence on not taking heed of 'near misses' in drug errors is also mystifying given the excellent learning that can be derived from tracking these.

NICE's approach is well aligned with safety science thinking about errors, adverse events and patient safety events more generally which acknowledges that a "person approach" and a "systems-based approach" is required to understand such events. For example, the person approach would look at medication errors as occurring due to human frailty alone, including forgetfulness, negligence or carelessness. Alternatively, a systems-based approach focuses on the system conditions surrounding the error. There may be system-level flaws that lead to medication errors, such as inadequate staffing cover, that constrain opportunities for nurses to take sufficient rest breaks, which cause tiredness and forgetfulness to occur. NICE's inclusion of missed breaks, nursing overtime and reliance on temporary staffing are clear examples of an attempt to understand nurse-sensitive indicators in the round.

2.2.4 Causality and confounding variables: critique of approaches used in nurse staffing research.

Randomised controlled trials (RCTs) and systematic reviews have been identified as the **'gold standard'** methods of determining the effects of healthcare interventions (Rothwell, 2005). However, a recent Cochrane Collaboration systematic review of hospital nurse staffing levels and patient and staff-related outcomes, which, in line with Cochrane Review protocols, restricted its review to RCTs, controlled clinical trials and controlled before and after studies, failed to identify any studies of interventions relating to nurse staffing levels, education mix, or grade mix that met the inclusion criteria.

As a methodology, RCTs certainly face challenges when used in the evaluation of complex interventions in everyday circumstances. For example, nurse staffing exists in uncontrolled, adaptive and open systems where many factors additional to nursing itself can affect patient outcomes, including organizational structure, workplace culture and actions of other non-nursing employees (Duffield et al., 2011; Hertel, 2012; West et al., 2014).

As Munier & Porter (2014) point out there are also ethical reasons why an RCT may not be able to provide the best evidence about nurse staffing. In particular the ethical principle of equipoise states that it is unethical to conduct a trial unless there is uncertainty about its outcome. Although the degree to which there is a causal link between specific numbers of nurses and patient safety on hospital wards is unclear, the complete absence or drastically reduced numbers of registered nurses is associated with decreased patient safety. In other words, having such knowledge, it would be unethical for researchers to design a RCT which subjects participants to what they already know is inferior treatment by exposing them to no or limited numbers of registered nurses.

As a result of RCTs being ethically and practically unworkable, alternative approaches to researching nurse staffing have relied heavily on the use of **observational studies** which measure variables of interest without randomly allocating participants to control or experimental groups. This lack of random allocation has traditionally been seen **as a weakness** which has led to observational studies usually being regarded as inferior to RCTs in the hierarchy of evidence (Song & Chung, 2010). For example, it is very difficult to determine from findings of observational studies whether observed associations are causal relationships.

Whereas the consistency of observational results into nurse staffing and patient safety suggests that the association may be real, it is **not possible to demonstrate a causal relationship of nurse staffing on patient outcomes**. For example, patient outcomes are influenced by a host of disciplines and factors, so the numbers of nurses for a given patient load may not be a good measure of outcomes sensitive to nursing practice. Patient co-morbidities and severity of illness, allied to the possibility that patients spend time in a variety of units/wards where staffing and practices may differ, or individual nurse characteristics such as experience and qualifications may all **confound** judgements made

about the overall effectiveness and quality of nursing care rendered (see box 2.5 for examples from the literature).

Researchers are fully aware that considerable variation exists across hospitals in the level of resources devoted to patient care. As Cook, Gaynor, Stephens, & Taylor (2012) point out, this variation exists in nurse staffing levels but also across many other dimensions such as the quantity and quality of medical equipment or the degree to which the professional development of staff is supported. However, whilst researchers often attempt to control for these factors, such attempts are inevitably limited by the extent to which *all* relevant factors can be measured and controlled within data sets.

Box 2.5: Confounding variables – examples of things that may confound the relationship between numbers of nurses and patient outcomes.

Butler et al (2011) – non-ward based **specialist nurses** and **specialist assistants** (e.g. in dietetics) can have an effect on patient outcomes such as length of stay (specialist nurses in a range of areas) and mortality (dietetic assistants on trauma wards).

Nicely, Sloane, & Aiken (2013) – "**volume-outcomes relationship"** meaning that mortality on surgical wards can be significantly different in hospitals in which specific surgical procedures are performed more often.

West et al (2014) - the **workload** of an intensive care unit had an impact on patient mortality in addition to the **numbers of medical staff** on the unit establishment.

Being unable to capture all relevant factors therefore, leads to the potential that **omitted variable bias** may occur. For example, if, as one might suspect, hospitals that have relatively high numbers of nursing staff also have above-average levels of other (unobserved or "uncontrolled") factors that positively affect patient care, such as high compliance with mandatory staff training or high numbers of other healthcare staff, cross-sectional or observational research will tend to overstate the impact of high nurse staffing levels on patient outcomes (Cook et al., 2012).

Contradictory results in the research may also be explained in this way. For example, Griffiths et al (2014) describe how apparently contradictory results in some studies that suggest, for example, increases in pressure ulcer rates in areas with high levels of nurse

staffing may be explained as a possible case of "**endogeneity"** or an **endogenous relationship,** where the relationship between pressure ulcers and high numbers of staff is a result of wards' being allocated more staff because they care for a lot of patients at risk of pressure ulcers.

2.2.5 Scale and subtlety of research findings.

Overall, much of the better quality research studies which have explored patient safety outcomes related to nurse staffing levels are derived from **large-scale**, observational research (the difficulties associated with observational research are discussed elsewhere in the report). Access to large administrative databases often adds an **undeniably impressive scale to studies**, with several thousand data items of patient outcomes being retrieved and reported on within studies, some of which have been known to span the continents of Europe and the USA (Aiken et al., 2012, 2014; Van den Heede et al., 2009a). However, there are **problems inherent to use of administrative databases** for research purposes, such as potentially lower reliability of data and measurement challenges.

Brennan, Daly, & Jones (2013) in their detailed review of the state of the science of nurse staffing research describe the strengths and limitations associated with utilising large databases for research purposes (see table 2.3). A challenge identified with the use of large databases was **inconsistencies in how variables were defined** and measured because researchers generally did not have flexibility to choose how variables were measured. For example, although nurse staffing was typically measured either as a nurse-to-patient ratio, the number of hours of nursing care provided during a defined time period, or a proportion of staff that consisted of RNs (skill mix), the authors **describe 82 different measurements of nurse staffing** within these broad categories. Additionally, **74 different patient outcomes** were also used, with variation in how the same outcome was defined and measured. Another review (Thungjaroenkul, Cummings, & Embleton, 2007) found **five different ways of measuring length of stay in 11 primary studies**.

Researchers (Van den Heede et al., 2009) who have published some of the largest and most impactful research in this area recognize the limitations associated with the use of administrative databases for research purposes (see also the overview of administrative data in section 3 of the report).

These large datasets are triangulated with data that rely on nurses' recalling salient details from their "last shift worked". Some of these data are about issues that directly involved nurses and are arguably more easily remembered (such as the numbers of patients they directly cared for). However, some of these data rely on recall of information that nurses may have had only partial awareness of (e.g. the total number of patients on the ward, or total number of nurses on duty). As a result **it is the scale of the research and subsequent argument that leave an impression on the reader, rather than the subtlety**.

Table 2.3: Examples of strengths and weaknesses associated with use of large administrative databases for research purposes (Brennan et al., 2013)

Strengths	Limitations
Databases are readily available	Underreporting of adverse events.
They offer potentially high external validity due to large sample sizes	Inconsistent use of diagnosis codes.
Low cost, both in time and money to obtain	Minimal adjustment for confounding variables
	Data aggregated at hospital level analysis omit unit/ward level context such as patient acuity. This leads to low external validity at the level of the ward.

We do not argue against the fact that large scale studies featuring fairly consistent approaches to study designs have led to significant insights about the association between the quantity of nurses on a hospital ward (RNs in particular) and a range of patient outcomes such as mortality or infections. However, one of the basic laws of logic warns that **"correlation does not imply causation"**. In the case of debates about nurse staffing levels the warning is not always heeded, as arguments sometimes veer towards arguments of causation based upon illusory correlation. That "**caution about causation"** is required can be demonstrated where what appears in one study to be a **genuine association emerging** between nurse staffing and a patient outcome (for example between staffing levels and urinary catheter infections), is later **questioned as potentially spurious**. Furthermore, some studies have found no associations between nurse staffing and patient outcomes, such as a large scale study in Belgium which reported **no association between nurse staffing and patient outcomes** at a hospital level (Van den Heede et al., 2009). Some

of the principles researchers in this field (Aiken et al, 2010: 905) have summarized, following the introduction of the California nurse staffing mandate that the relationship between an 'increase in nurses is associated with improved outcomes has been more difficult to determine'.

However, identifying that the reasoning behind an argument is flawed **does not imply that the resulting conclusion is necessarily false**. Instead there is an urgent need to fully explore how and why nurse staffing and nursing characteristics affect patient outcomes within and across hospital wards, in the hope that the ratio of genuine patterns to spurious patterns – of "signal to noise" – quickly moves towards zero.

This points to the **next challenge in nurse staffing research**: how to address some of the limitations in observational research that are reliant on large administrative databases. In the near term we must ask how researchers can bring together "big data" approaches with small data studies – large scale quantitative research with traditional qualitative methods. Data insights can be found at multiple levels and by combining statistical analysis with methods such as ethnography, depth can be added to the data collected and analysed. A much richer sense of the world of nursing work is achieved when we ask people the "why" and the "how", not just the "how many". However, this needs to extend beyond merely arranging focus groups to confirm what is already seen within a large dataset. Instead it means complementing data sources with rigorous qualitative research that seeks a more complex understanding of the quantitative results, but also brings a heightened sense of context-awareness that may address some of the more serious "signal to noise" problems. The focus can then move towards a more in-depth, three dimensional view of nurse staffing.

2.3 Unintended consequences of mandatory nurse staffing levels

One of the hallmarks of current thinking is that the delivery of healthcare should be seen as occurring within a complex system characterized by interrelationships and interdependencies. Seen in this way a change in one place can trigger an unforeseen impact elsewhere (Hannigan, 2013). That change often leads to unintended consequences was discussed by the 17th century Enlightenment philosopher John Locke, although the

adoption of complex systems thinking and the concept of unintended consequences has, until recently, been sluggish within the field of healthcare policy making.

Researchers and commentators interested in nurse staffing levels seem well aware that introducing a change in one area of staffing can have an unintended effect elsewhere. Non-nursing healthcare professions express such fears, namely that legislating for minimum nurse staffing numbers reduces the numbers of allied health professional posts, for example physiotherapy or occupational therapies. Researchers have also expressed similar thinking (Sochalski, Konetzka, Zhu, & Volpp, 2008; Buerhaus, 2009), although the research evidence is equivocal on this matter, as well as being limited in scope.

For example, one of the stronger studies that consider such unintended consequences (Serratt, Harrington, Spetz, & Blegen, 2011) explored staffing changes before and after mandated nurse-to-patient ratios were introduced in California's hospitals. Their findings from data collected from 273 hospitals indicate that most hospitals made **upward adjustments in their RN** numbers but **decreases** in support staff (housekeeping, maintenance and laundry staff, for example) and other non-nurse staff (physiotherapy, occupational therapy, speech and language therapy, for example) **were not evident, with evidence of increases** for some staff categories. However, the data were collected only in the second year following implementation of the mandate, thus conclusions about longer-term effects cannot be reached. The lack of longer-term research into the effects of mandatory nurse staffing changes on other areas of the workforce and the financial implications thereof are recurring limitations within the literature.

Similarly, Aiken et al., (2010) found 'little evidence of unintended consequences of the California legislation that are likely to negatively affect the quality of the nurse work environment or patient care' (p.917) following their survey of 22,236 nurses. The latter part of this quote ('that are likely….' onwards) is important as survey respondents did report quite substantial decreases in unlicensed personnel (similar to HCSWs) and non-nursing support services such as housekeeping and ward clerks, although nursing skill mix on the whole improved. Additionally, there was no evidence in their survey that the reduction in non-nursing support increased nurses' workloads, although we need to reinforce the point that the research was undertaken within two years of the mandated changes' occurring.

As a result we should view the authors' conclusion of 'little evidence of unintended consequences' as emerging from a rather limited timescale and a narrow characterization of unintended consequences, which is defined only by adverse effects on patient outcomes. A broader definition of unintended consequences, that included consequences for the workforce more generally, may have reached a different conclusion.

An unintended consequence of the California mandate was the effect on nurses' preferred time for a meal break. California law prohibits employers from staffing an employee for more than five hours without a meal break of at least 30 minutes. Those working 10-12 hours are entitled two 30 minute breaks. Because the nurse staffing mandate insisted on minimum ratios at all times (as does section 1 of the Safe Nurse Staffing Levels (Wales) Bill) the meal break law combined with the mandate created a challenge for hospital managers. Nurses reported disruptions to their preferred meal breaks and that unsafe decisions were made to cover the shortfall during meal breaks. Many hospitals hired "float pools" of nurses who moved around the hospital to meet the ratios during meal breaks, or a short shift nurse working three hours to cover breaks. Ancillary staff were in some cases laid off to boost the budget to hire more RNs (Chapman et al., 2009).

Findings from Florida of a study following the introduction of a mandatory nurse staffing level in nursing homes (Thomas, Hyer, Andel, & Weech-Maldonado, 2010: 568) concluded that 'there are unintended consequences of staffing mandates in indirect care staffing'. For example, the number of indirect care staffing hours (provided by housekeepers, recreational therapists and activities staff) 'declined significantly' (p. 555) across their sample of 714 Florida nursing homes following mandated increases in nursing staff. The authors concluded that mandating for minimum nurse staffing levels impacted on resource allocation decision-making within nursing homes.

Another issue related to resources was identified by Spetz, Harless, Herrera, & Mark (2013) who discussed more rapid wage growth and reductions in operating margins following the mandatory nurse staffing changes in California. Prior to the introduction of the California mandate, the average predicted **increases in full-time equivalent RN employment was 2.8 to 4%,** which seem to have been accurate (OECD, 2005). Although such costs may be worthwhile in the presence of benefits to patient outcomes there is no consistent link

between improved patient outcomes and the mandatory changes to nurse staffing in California, and as a result the 'net effect of nurse staffing legislations remains unknown' (Spetz et al, 2013 p.395).

Mandatory nurse staffing levels led to more agency nurses' being used (Aiken et al., 2010), suggesting that existing nursing numbers within the Californian healthcare system could not supply the increased demand for nursing staff. Bank and agency staff costs in the UK have escalated sharply recently, and the data collected for this study bear testament to this (see section 3) which also suggests **that the current supply of ward-based nurses struggles to match the existing demand** for nurses and may well struggle to meet **further demands resulting from legislation**. We also have evidence in our data where temporary staff (bank or agency nurses) were unable to be sourced to meet existing shortfalls in nursing numbers. In these instances of shortages, **ward sisters/charge nurses were counted in the nursing numbers contrary to current best practice staffing principles in Wales** (as will be discussed in more depth later in the report).

The perception of a nursing workforce shortage can also be seen in the NHS Wales Staff Survey (2013) which shows that 19% of unregistered nurses and 16% of RNs reported being moved from their clinical area to another where they have not felt confident or competent to work (the numbers who were moved and felt confident and competent to work were not recorded). A total of 56% of all staff in NHS Wales disagreed with the survey statement "there are enough staff at this organization for me to do my job properly" and 70.2% of respondents[3] to an RCN survey (Royal College of Nursing, 2013) identified staff shortages and workload (81.9%) as the top two contributors to workplace stress. Against this backdrop of apparent nursing and staff shortages it may also be the case that nurses worked longer shifts or overtime to cover for shortfalls in nurses' availability. The RCN survey reported that nurses worked 'extensive unpaid overtime' (p.13) and felt 'emotionally blackmailed to work overtime' (p.61).

[3] The RCN 2013 survey uses a sample of its membership which is discussed more fully in Section 3.6 below.

Although the Australian state of Victoria's government claims that 2650 nurses who had not been working in nursing have re-entered the workforce since legislating for minimum nurse staffing thus boosting availability of nurses for recruiting (OECD, 2005), the experience from California was very different with managers frequently reporting difficulty in finding nurses to hire (Chapman et al., 2009). It is unclear, therefore, whether Wales is like Victoria and has similar reserves of nurses who would rejoin the NHS workforce, or is more akin to California. Any prospect or prediction of large numbers of nurses' returning to the workforce has to be counter-balanced with the numbers of nurses who are approaching retirement and the recent findings of a large European study (England and Ireland included) that showed between 2 in 10 and 5 and 10 nurses intended to leave their current job in the next year and between 2 in 10 and 4 in 10 indicated that they would seek a job outside nursing (Aiken et al., 2013)

The intended effect of introducing mandatory nurse staffing levels is obviously to improve patient safety outcomes, as well as a secondary gain in improving staff well-being. However, mandatory staffing levels will result in more demand for nursing hours; allied to a shortfall in nursing supply evidenced in our data and recent nursing workforce surveys, the possibility exists that mandatory staffing levels may well lead to unintended consequences related to nurses' working longer hours to cover the expected increase in demand for nurses. For example, a European study (Griffiths, Dall'Ora, et al., 2014) of 31,627 RNs in general medical/surgical units found that RNs working shifts of 12 hours or more and those working overtime were more likely to report poor or failing patient safety, poor quality of care and more care left undone. Similar findings relating to deterioration in patient safety outcomes linked to 12-hour shifts and over 40 hours a week have been found elsewhere (Rogers, Hwang, Scott, Aiken, & Dinges, 2004; Scott, Rogers, Hwang, & Zhang, 2006).

Moving from three short shifts to two longer ones may become a popular strategy to maintain nurse-to-patient ratios with fewer total staff, especially where current nursing numbers are low. Griffiths et al (2014) recommend caution before proceeding in this direction (even though it has been advocated by NHS England), whilst highlighting that use of overtime working to mitigate staff shortages may also incur risks to quality of care.

2.4 Nurse staffing, nurse safety and "staff experience".

Compared to the focus on patient safety outcomes, much less attention has been given to how **nurse staffing affects the safety of nurses** themselves, although a small body of work does exist that considers so-called 'nurse outcomes'[4] associated with staffing levels. For example, an OECD (2005) report on tackling nurse shortages in its member countries described how there is ample evidence that nurse dissatisfaction with staffing levels can lead to low morale and job satisfaction, higher stress and burnout and work-related injuries, all of which can result in absenteeism thereby increasing nurse turnover and exacerbating nurse shortages.

More recent studies from England have reinforced these claims (Ball et al., 2012), with others finding that the link between better positive working environments and lower burnout and higher nurse retention remains strong globally (Aiken et al., 2011, 2013). Similarly, nurses' perceptions of short staffing have been identified as the most consistent predictor of job and career satisfaction (Halm et al., 2005) which seems to link with Rafferty et al., (2007) who suggest that better staffed hospitals may be more successful in retaining their nurses.

The association between "nursing outcomes" and patient outcomes was recently explored in a large scale study in the USA (Cimiotti, Aiken, Sloane, & Wu, 2012) which reported burnout in nurses being associated with both urinary tract and surgical site infections in patients. The authors explain that the association between burned-out nurses in a hospital and increased rates of both infections were clinically and statistically significant. They forecast that a 10% reduction in nurses with high burnout from an average of 30% could prevent 4160 infections and lead to a cost saving of $41 million in Pennsylvania hospitals.

Higher proportions of nurses on hospital wards may also result in reduction in harm occurring to nurses. For example, the numbers of patients to nurses appear related to occupational health issues such as back injuries and needlestick injuries (Clarke &

[4] Not to be confused with the "nurse sensitive outcomes" discussed in section 2.2.3 these "nurse outcomes" relate to the well-being and workplace welfare of nurses.

Donaldson, 2008). Similarly, factors associated with needlestick occurrences on shifts include lower RN skill mix, a lower percentage of experienced staff and fewer nursing care hours per patient per shift (Patrician, Pryor, Fridman, & Loan, 2011).

Another harm occurring to nurses that appears to be associated with staffing is verbal abuse from patients and families. For example, hospital wards that had better compliance with the California nurse staffing mandate had significantly lower reporting levels of verbal abuse by patients (or staff). Ball et al., (2012) describe how the most frequent type of incident impacting on nurses' working lives is verbal abuse from patients and/or their families, with 28% of nurses reporting that this occurred at least a few times a month and more frequently on wards with higher nurse-to-patient ratios and on medical wards as opposed to surgical wards.

It appears therefore that mandating for minimum nurse staffing may have a beneficial impact on staff retention, morale and engagement. These factors, which broaden our understanding of the relationship between staffing and patient outcomes beyond merely looking at skill-mix ratios, or numbers of nurses per patients, may well explain some of the conflicting results relating to nurse staffing levels and patient outcomes such as mortality. For example, a large study (Dixon-Woods et al., 2013) of NHS patient safety and workplace culture recently found that 'hospital standardized mortality ratios were inversely associated with positive and supportive organizational climates' (p.7). In particular higher levels of staff engagement and wellbeing (both associated elsewhere in the literature with adequate staffing levels and activities such as staff appraisals) were associated with lower levels of mortality, whereas sub-optimal staffing was identified as a leading threat to patient safety and quality.

Earlier in the review we discussed Shekelle's (2013) assertion that patient mortality may not merely be reduced by increases to nurse staffing, but by something that the nurses do. In light of the literature emerging about the potential relationship between mortality and patient safety on the one hand and staff engagement, good management and the broader organizational culture on the other, we believe that focus should be extended not only to looking at nurse staffing and what nurses do, but also what the broader organization does in terms of the interaction between staffing and broader organizational culture.

2.5 Consideration of the evidence for staffing level 'tools' in supporting or informing decision-making on staffing levels.

A recent report (Healthcare Financial Management Association, 2014) described how research studies carried out over the last few years have shown that while workload and workforce planning tools can offer useful assistance to nurse managers, there is no "perfect tool" that will answer all questions. This view is supported and extended in a recent detailed review of nurse staffing (Griffiths et al, 2014) which found that methods for determining staffing adequacy are not well validated and measures lack standardization. Overall it seems that systems to determine staffing requirements do not adequately capture nursing work or provide sufficient accuracy for resource allocation or for workforce planning.

This is surprising given that a plethora of observational studies suggests there is a link between patient acuity/dependency, case mix and patient outcomes (for example McGillis Hall, Doran, & Pink, 2004; C. Duffield et al., 2011; Shekelle, 2013) with Duffield et al (2011) however emphasizing that case mix should be considered as a factor independent of acuity. A further important conclusion from Griffiths and colleages (2014) was that there was no clear evidence in studies of specific differences in staffing requirements between ward types, such as medical versus surgical wards, or care for older people. This is an interesting finding given that the California nurse staffing mandate provides staffing guidelines for a range of very different wards (at least 13) from medical, surgical, psychiatric to telemetry units, little of which seems to have been based on research evidence. The few studies evauating the guidelines in specific areas, in this case telemetry units, have led to questions about the usefulness of mandated staffing levels (Upenieks, 2007).

2.6 Recent governmental reports and quality of care inquiries

The Keogh review (Keogh, 2013) looked into 14 hospital Trusts in England that had been performance outliers based on two mortality indices. The review teams found inadequate numbers of nursing staff in a number of ward areas, particularly out of hours (at night and at the weekend). This was compounded by an over-reliance on unregistered support staff and temporary staff. As a result one of the identified ambitions for improvement was that 'nurse staffing levels and skill mix will appropriately reflect the caseload and the severity of

illness of the patients they are caring for and be transparently reported by trust boards' (ambition 6, p.11). The review recommends, as set out in the *Compassion in Practice* section, that Directors of Nursing in NHS organisations should use evidence-based tools to determine appropriate staffing levels for all clinical areas on a shift-by-shift basis. One way of achieving this would be for Boards to sign off and publish evidence-based staffing levels at least every six months, providing assurance about the impact on quality of care and patient experience.

The Berwick report (National Advisory Group on the Safety of Patients in England, 2013) identified key recommendations to improve the safety of patients in England. One of these stated that government, Health Education England and NHS England should assure that sufficient staff are available to meet the NHS's needs now and in the future, and that healthcare organizations should ensure that staff are present in appropriate numbers to provide safe care at all times and are well- supported (recommendation 4, p21). Berwick and colleagues recommend that boards and leaders of provider organisations should take responsibility for ensuring that clinical areas are adequately staffed in ways that take account of the varying levels of patient acuity and dependency, and that are in accord with scientific evidence about adequate staffing. They also recommend that staffing levels should be consistent with the scientific evidence on safe staffing, adjusted to patient acuity and the local context. This includes, but is not limited to, nurse-to-patient staffing ratios, skill mix between registered and unregistered staff, and doctor-to-bed ratios. Boards and leaders of organisations should utilise evidence-based acuity tools and scientific principles to determine the staffing they require in order to safely meet their patients' needs. Finally, they recommend that boards make their conclusions public and easily accessible to patients and carers and accountable to regulators.

The Francis report (Francis, 2013) attributed the inadequate standard of nursing that was offered on some wards in Stafford, England, to poor leadership and staffing policies. The complaints heard at both the first inquiry and this later one testified not only to inadequate staffing levels, but poor leadership, recruitment and training. This led in turn to a declining professionalism and a tolerance of poor standards. Staff reported many incidents which

occurred because of short staffing, exhibited poor morale in their responses to staff surveys, and received only ineffective representation of concerns from the RCN.

The Trusted to Care report (2014) provided an independent review of quality and safety in older people's care in two hospitals in Wales. The Review Team were also concerned about the way staffing levels in the medical wards were determined as this seemed unconnected to the level of dependency and need on a ward at a specific time. They reported that there was a sense of a last minute nature of staffing of wards with staff in charge seemingly working in isolation to secure the skills needed to cover shifts, especially at night. It was also noted that there was a lack of responsiveness of staffing levels on any shift to specific needs of patients at that time. There seemed to be no flexibility to add or move staff to support appropriate care for patients with behaviour or mobility issues, for example. It was reported that unacceptable practice was used to cope with the consequences, such as immobilising patients requiring support and leaving them to soil themselves in their beds. Other examples of poor practice included providing no support in feeding; making no observations or keeping records of occasions when the meals provided were not taken by the older people concerned; leaving food out of patients' reach, and paying insufficient attention to basic shift and staff planning.

These reports highlight that there is a need for appropriate staffing levels and skill mix within a culture of openness and transparency, where staff can voice their concerns without fear of being penalised. The periods identified where staffing levels and skill mix are more likely to need further attention are evenings and weekends, although it is notable that our review of literature indicates that little research is undertaken into nurse staffing that considers staffing fluctuations over the working day, days of the week or seasonal variation. The report recommends that staffing levels are reviewed as an evidence-based practice that should be adjusted to caseload, patient acuity, current research and interprofessional learning.

These reports highlight that even though staffing levels are a measurable indicator that has been linked to poor levels of care, there are wider systemic issues in leadership and management that need to need to be addressed in order to improve standards of care. For

example, the Francis and Trusted to Care reports highlight low staffing levels not as problematic per se but emerging as a product of poor leadership which resulted in inappropriate staffing policies as well as a culture of acceptance of poor standards of care. None of the reports advocate a fixed nurse-to-patient ratio.

2.7 Health economics research

None of the economic studies reviewed were conducted in the UK. As a result it is impossible to accurately judge from an NHS perspective the economic impact of mandatory nurse staffing levels on outcomes from the NHS. The results of the studies that do exist are of limited value in informing decision-making in the NHS context.

The economic impact on nurse scheduling of mandatory nurse to patient ratio have been difficult to quantify (Wright, Bretthauer, & Cote, 2006) while identifying minimal impact on wage savings due to the complexity of shift variances. Some evidence suggests higher nurse to patient ratio have an economic impact on healthcare budgets (Thungjaroenkul, Kunaviktikul, Jacobs, Cummings, & Akkadechanunt, 2008) as a result of increased labour costs as well as being less cost effective at lower patient to nurse ratios (Rothberg, Abraham, Lindenauer, & Rose, 2005). In addition the introduction of minimum staffing ratios impacts and limits the amount of uncompensated care as a result of the allocation of resources to staffing rather than direct care provision (Reiter, Harless, Pink, Spetz, & Mark, 2011) with minimum nurse staffing ratios impacting on the economic performance of healthcare organisations and the delivery of inpatient care (Reiter, Harless, Pink, & Mark, 2012).

However, other findings suggest that an increase in nurse staffing levels was not cost effective when trade offs in costs associated with a reduction in hospital admissions were taken into account (Ganz, Simmons, & Schnelle, 2005). However, Computerised Nurse Dependency Management Systems (CNDMS) seem to have some capacity to measure nursing hours required per patient per day with cost analysis evidence suggesting the use of computerised staff management tools are more cost effective in nurse management and allocation than dependency on minimum staffing ratios (Heslop & Plummer, 2012).

2.8 Conclusions from the rapid evidence appraisal

A considerable volume of international evidence exists, largely generated by observational studies, that suggests higher nurse staffing levels are positively associated with improved patient outcomes and safer patient care. However, despite being able to link patient outcomes, staffing levels and other nursing workforce characteristics, it is impossible to link individual nurses and patients and therefore establish causal relations. As others have noted (Clarke & Donaldson, 2008) the conclusion that has to be reached is that there is no guarantee that increasing nurse staffing alone improves the process or outcomes of care.

To summarise: on the one hand, the conclusion that there is no simple causal link between patient outcomes, patient safety and staffing levels can be accepted. On the other hand, even though we know that patient safety is the outcome of a myriad of interpolating causal mechanisms, the research findings are compelling on the fact that the number of RNs on hospital wards (as opposed to healthcare support workers) plays a crucially important role in patient safety. The danger is that such argument and counter-argument can lead to nurses' being left in a state of limbo with no impetus or progressive thinking about the staffing questions that exist regardless of academic or political deliberations. On the whole, therefore, we tend to agree with Munier & Porter (2014: 600) who state that 'it is not good enough to hide behind technical arguments about the inadequacy of non-RCT derived evidence when a clear danger to patient safety has been demonstrated in terms of association'.

One of the most important questions that few have answers for is whether the decisions about nurse staffing need to be made at the discretion of nurses and managers or by dint of national legislation. Registered nurses and their representatives are usually fiercely defensive of their right to autonomous clinical decision-making. However, in the case of nurse staffing, they appear to be satisfied to allow state regulation to intervene as, for example, the events reported in the Mid Staffordshire inquiry and the Keogh review demonstrate that some senior nurses and hospital managers could not be relied upon by nurses at the frontline or by the public to make safe staffing decisions. The research evidence on the whole demonstrates largely positive effects linked to improved nurse staffing, with no reports found that showed that when RN numbers are increased, patient

outcomes deteriorate. There is also largely consistent evidence from a number of studies that support an association between a nursing skill mix that has a higher ratio of RN to HCSW on wards and patient outcomes such as lower mortality, infections, falls and pressure ulcers.

3.0 THE AVAILABILITY AND ACCESSIBILITY OF NURSE STAFFING DATA IN WALES

This section of the report describes data that were collected to address the following aims from the tender document.

- to establish current and historical data that are available on nurse staffing levels in adult acute wards across Local Health Boards (LHBs) in Wales; and
- to analyse these data in order to produce evidence of current staffing levels by LHB and nationally, along with historical trends where possible at national and LHB .

All of the time allocated to this phase of the study was consumed in answering questions relating to the accessibility and availability of current nurse staffing data from medical and surgical wards in NHS Wales. As a result we were unable to report on historical data trends; our attempts to do this were largely frustrated by the amount of time it took to access contemporary data and the fact that historical staffing data appears not to be readily archived or analysed in NHS Wales organisations. The only publicly available historical source of NHS Wales staffing data were **annual figures** produced by broad staffing groups, including grade and area of work at an organisational level.

All staffing data originate within individual Welsh NHS LHBs and Trusts. There are a **variety of systems**, processes and software packages used to capture and hold staffing information at this local organizational level which have evolved to meet key local operational needs, for example Human Resources (HR), payroll, and workforce planning. Elements of this information (but not all) either flow automatically via electronic-rostering tools or via manual entry into the 'Production' Electronic Staff Record (ESR-Pr) Database. The collection of staffing data within LHBs often reflects historical norms and working practices that extend to the time before reorganisation of NHS Wales into LHBs in 2009. For example, one LHB appears to operate three distinct processes that were in existence in each of the former NHS Trusts from which the LHB was created.

The only way to access nurse staffing data at a ward level is via ad-hoc requests made directly to individual LHBs. As described below (section 3.7) this was the approach taken for this phase of the project. Within a limited timescale it was possible to collect a large amount of data via this approach; namely staffing data from 181 individual medical and

surgical ward areas from six LHBs. However, as we will go on to explain, it is not clear how sustainable this approach to data collection would be on a more regular basis.

From the ward data gathered it is apparent that there is **variation across LHBs** in how the request was interpreted and how data were reported. There is also variation in the systems used to collect and manage this information. While there may be valid reasons for this, it makes construction of a robust all-Wales dataset difficult to achieve and can preclude meaningful comparison between organizations and wards.

Each UHB has its own **ESR-Pr** database to which it has sole access. ESR-Pr only contains details of staff directly employed by LHBs, such as permanent and bank staff. Agency staffing data are held within the finance system of LHBs, with the result that ESR-Pr is unable to capture this information, thus **reducing the ability to accurately describe** staffing on individual wards within one information system. Furthermore, there are issues around **data quality** within ESR-Pr (section 3.5) that suggest deficiencies in its robustness.

A reduced monthly 'snapshot' of data within the ESR-Pr is taken from each LHB and Trust to produce the ESR Data Warehouse (ESR-DW). The **ESR-DW** is essentially a separate database to the ESR-Pr consisting of a time series of monthly 'snapshots' (described below in section 3.1). These monthly snapshots are the only source we found that combines data from across Wales, giving staffing insights at a national (Wales) level. It is the September snapshot that is used as source for the annual figures produced by Welsh Government.

All national NHS staffing data available for use by different organisations such as the NHS Wales Workforce, Education and Development Service (WEDS), Welsh Government and the NHS Wales Informatics Service (NWIS) originate from the most recent monthly update to the ESR-DW. NHS Wales staffing information that is made publicly available - for example, though Stats Wales or by the NHS Health and Social Care Information Centre (NHS HSCIC) also originates from this source. During our project, these organisations responded promptly to our requests for data which were available but not published.

Under this system of data management the **complexity and fidelity** of the staffing data accessible from outside the LHBs is progressively **reduced** to the point where nurse staffing data are available only by broad categories such as area of work (specialty) and grade at an

organizational level. It is not possible to see staff by individual hospital or ward and no staffing data appear to be triangulated with patient safety outcomes or other quality outcome metrics such as patient length of stay.

Therefore, proposals to legislate and monitor "safe nurse staffing" ratios or skill-mix appear **premature** given the current absence of a robust, centralised and linked data system for the accurate recording and reporting of all aspects of nurse staffing, workforce planning and patient outcomes. We may indeed have a scenario where medical and surgical wards in Wales may already have nurse staffing levels within the boundaries of what is considered "safe"; although this scenario appears unlikely the salient point is that there is no clear or established means of gathering accurate data, nationally or locally, to demonstrate this one way or another.

What is also notable about many of the high profile campaigns focusing on safe nurse staffing in Wales and elsewhere is the complete focus on clinical data, and the lack of attention to broader workforce-related data such as the availability and rostering of medical, ancillary and allied health professionals or monitoring staff intention to leave or "churn" (sometimes called attrition rates), despite arguably their much larger role in achieving better patient safety and within the operation of the NHS more generally (Hockley and Boyle, 2014). To put it simply, an equal amount of the scrutiny that is currently applied on the nurse-to-patient interface should also be applied to the workforce processes that make this interface possible.

3.1 The Electronic Staff Record (ESR)

ESR is used by all the NHS organisations in England and Wales (NHS 2015) and has been in place in Wales since the end of November 2006 (WG 2015). ESR is an integrated HR, payroll and learning management system rather than a mechanism to monitor ward level staffing.

The Production-ESR (ESR-Pr) is a 'live' database consisting of over 160 staffing data variables (such as ethnic category, disability status, job role, absences, pay scale code, occupation code) covering all NHS staff working for each individual organisation (NHS HSCIC 2015). Each individual NHS organisation's ESR-Pr database is confidential, with no one

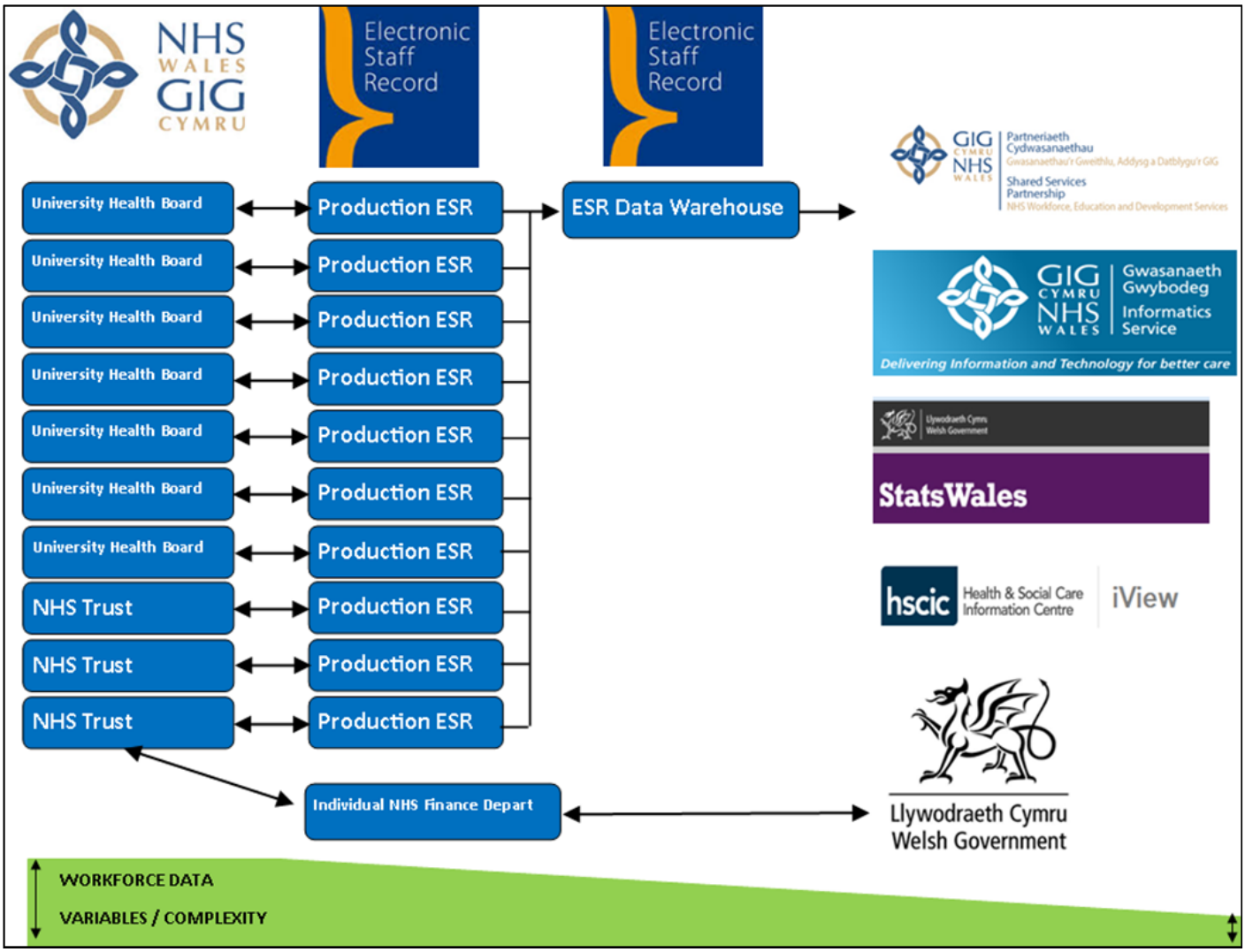
national body or organisation having access to all the individual England and Wales NHS Trusts' ESR-Pr databases.

However, **only a reduced number of these variables** are included in the monthly 'snapshot' to the ESR-DW. The ESR-DW is a separate database that enables staffing data to be reported at national and multi-NHS Trust levels. The ESR-DW is populated by monthly extracts from ESR-Pr databases (see figure 3.1). The data are used by a number of regional and national bodies such as Strategic Health Authorities (SHAs) previously and their successor bodies; Deaneries; the Health and Social Care Information Centre (HSCIC) the UK Department of Health and the Welsh Government (including WEDS and NWIS).

The security profile for the ESR-DW, which is already a reduced version of the ESR-Pr, imposes a number of **additional restrictions** to access, where access is made dependent on the reasons for wanting to view the data. In addition there is a lag-time of around six weeks to access data from the ESR-DW. For example, given the staffing census date of 10 December 2014 to access ward area data in Wales for this project (described in section 3.7), corresponding data from the ESR-DW were not available until mid-February 2015.

As figure 3.1 illustrates, staffing data does flow within Wales and are accessible to NHS organisations and transparent to the public. However, for what appears to be reasons of data security, the amount of variables reported and therefore the degree of data complexity is reduced as the information flows towards NHS and government organisations and the public. Although the need for robust information security is obvious, there may be grounds to assess whether there are means to provide a secure information environment that also allows for data complexity, linkage and analysis beyond what is currently on offer. **This would allow more detailed intelligence to the end users of data, meaning that NHS and governmental organisations in Wales may make better workforce-related decisions whilst also offering more transparency for the Welsh public**.

Figure 3.1 : Overview of Workforce Data Flows in Wales



3.2 Public availability of Welsh NHS staff data and comparison with other UK countries

The only publicly available Welsh NHS staffing data produced on an **annual basis** are those published by the Welsh Government as official statistics[5], accessible through the Stats Wales website[6], hosted by Welsh Government with data supplied by WEDS. This gives data across the NHS workforce and specifically on Nurse, Midwifery and Health Visitors by grade and area of work[7] (See Box 3.1). The source of these data from 2006 is the DW 'snapshot' taken annually in September and used to represent the corresponding year, prior to 2006,

[5] http://gov.wales/statistics-and-research/staff-directly-employed-nhs/).

[6] https://statswales.wales.gov.uk

[7] In this context 'area' denotes clinical specialty rather than physical location.

data are available from 1996 onwards gathered from administrative data collections (WG 2015).

Box 3.1: Nursing Midwifery, health Visitor Grade and area of work data

Grade	Area of Work
Nurse Manage	Acute, Elderly and General
Nurse Consultant	Community Learning Disabilities
Children's Nurse	Community Psychiatry
Registered Midwife	Community Services
Health Visitor	Education Staff
District nurse / CPN / CLDN - 1st level	Learner - Diploma Nurse Training
District nurse / CPN / CLDN - 2nd level	Learner - District Nursing
Qualified School Nurse	Learner - Health Visiting
Other 1st level nurse	Learner - Midwifery
Other 2nd level nurse	Maternity Services
Modern Matron	Neonatal Nursing
Nursing Assistant Practitioner	Other Learners
Nursery Nurse	Other Learning Disabilities
Nursing Assistant / Auxiliary	Other Psychiatry
Nurse Learner - pre registration	Paediatric Nursing
Nurse Learner - post registration (1st level)	School Nursing

This contrasts with workforce data provision in other UK countries (summarised in Box 3.2). Both Scotland and England produce regular staffing reviews and analysis (Scotland quarterly and England monthly) consisting of data table publications and related analysis/commentary. Northern Ireland historically produced quarterly workforce data bulletins (2009-2013) which have since September 2013 been replaced by an annual workforce bulletin. While NHS Workforce data systems in Scotland and Northern Ireland are distinct from the ESR information system used in England and Wales, it is noteworthy that although England and Wales share a common information system the frequency and detail of workforce reports produced differ.

Box 3.2: NHS Staffing data available in other UK countries	
Scotland	Produced by the Information Services Division
http://www.isdscotland.org/Health-Topics/workforce/	Publish quarterly updates as a 'National Statistics' publications of Workforce Information, with about a 2 month time-lag. Available as a monthly publication time series to June 2010 There are clear links to most recent Scottish Government policy Docs, FAQ, data quality, descriptions all very transparent. http://www.isdscotland.org/Health-Topics/Workforce/FAQ/#_What_are_the
England	Produced by the NHS HSCIC
http://www.hscic.gov.uk/workforce	produces workforce data on all NHS England organizations on a monthly basis, with a lag-time of around 6 – 8 weeks. This appears to be the full data from the Data Warehouse down to area of work/ occupation codes – but not by Ward. Downloadable data files are accompanied by a detailed bulletin. The HSCIC also produces data quality metrics for all NHS organizations in **England and Wales** for staff information held within ESR
Northern Ireland http://www.dhsspsni.gov.uk/index/statistics/workforce.htm	Run by the Department of Health, Social Services and Public Safety Quarterly data available from 2009 to 2013 across 11 broad NHS employment groups – slightly more detailed than Wales. From 2014 data are now published through an annual staff census report and downloadable data. Also have some good data visualisations and links to the workforce planning team, but no information on systems used to collect workforce data.

3.3 Welsh staffing data from the ESR-DW

As already discussed, it is not possible to access acute ward staffing data from ESR-DW. However, using the 'area of work' variable it is possible to limit the broad 'Nursing, Midwifery and Health Visiting' staffing group by the 'acute, general and elderly' area of work. While this information is held on an annual basis by Stats Wales it uses the September DW 'snapshot' as a representative for individual years. To correspond with the census date of 10th December 2014 used in later ward data collection (see Section 3.7), we requested that WEDS produce a specific set of Welsh nurse staffing figures derived from the December 2014 ESR-DW snapshot. This gave us the opportunity to also request corresponding information on Agenda for Change banding and registration data which is not publicly available.

This allows for differences to be explored between Welsh LHBs and Trusts by staff working in 'acute, general and elderly' (as a proxy for medical and surgical wards) by various factors such as Agenda for Change banding, Place of Registration, Length of Service and Age. Across the 'acute, general and elderly' group we see that the nursing skill mix in Wales consists of approximately **30% unregistered nurses (Bands 2 to 4) and 70% registered nurses (Bands 5 to 9)**. Within the group we see a **narrow variation** across the six LHBs that were included in this project, ranging from 27% unregistered nurses to 73% RNs in Abertawe Bro Morgannwg UHB to 33% to 67% in Aneurin Bevan UHB, all of which are no less than the **All Wales Nursing Staffing Principles which states that the skill mix of RNs to healthcare support workers in acute areas should generally be 60:40**.

Powys Teaching Health Board has the highest proportion of unregistered nurses (39%) to registered nurses (61%). Due to the lack of acute medical and surgical beds in Powys, this ratio may be unsurprising to some, although the admittedly limited literature on improved patient and staff outcomes associated with higher percentages of RNs in the workforce strongly suggests these exist equally in areas of care that are non-acute.

It is easy to identify areas of variation which can be explained further. For example, there is a disproportionately higher number of senior nursing staff (band 8 upwards) employed by specialist NHS Trusts such as Velindre or Public Health Wales (PHW) compared to the LHBs (Table 3.1). However, there are other examples of variation that are less easy to explain. For example, there are some notable differences within the RN population at band 5 and 6 between neighbouring LHBs; such as 35.5% of RNs at band 5 within the Cardiff and Vale (C&V) nursing workforce compared to 49.2% at Abertawe Bro Morgannwg (ABM). However, C&V have 20.7% of their workforce at band 6 compared to 10.3% in ABM, which may explain the relative differences at band 5 i.e. a smaller proportion of band 5 RNs in the C&V workforce as a consequence of their nationally high numbers of RNs at band 6.

However, it is important to note that **analysis at this level is crude** at best. For example, we can see differences between LHBs but this does not take into account the different needs or healthcare demands faced by different geographical or population groups across Wales that may explain the variations in the workforce that can be seen.

Table 3.1 Nurse Staffing (%) by AfC Band for Welsh NHS Organizations limited to 'Acute, Elderly and General' area of Work – Dec 2014

AfC Band	ABM UHB	Aneurin Bevan UHB	Betsi Cadwaladr UHB	Cardiff & Vale UHB	Cwm Taf UHB	Hywel Dda UHB	Powys LHB	Public Health Wales	Velindre Trust	Wales Total
Band 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Band 2	25.2	25.9	22.5	25.9	28.0	21.2	29.7	0.0	13.4	24.4
Band 3	1.6	7.2	6.5	6.3	4.1	7.1	9.2	0.0	17.2	5.7
Band 4	0.2	0.0	0.4	0.7	0.1	0.8	0.1	0.0	2.6	0.4
Band 5	49.2	44.2	42.0	35.5	42.7	45.1	42.2	6.9	22.5	42.7
Band 6	10.3	11.5	14.8	20.7	12.5	13.5	8.7	14.9	21.7	14.0
Band 7	11.2	9.7	11.4	9.1	10.3	10.2	6.0	56.0	15.6	10.5
Band 8a	1.6	0.9	1.6	1.1	1.8	1.2	2.7	7.4	4.4	1.5
Band 8b	0.5	0.1	0.4	0.4	0.2	0.6	0.0	3.7	1.0	0.4
Band 8c	0.1	0.1	0.1	0.0	0.2	0.2	1.0	3.7	0.9	0.1
Band 8d	0.1	0.1	0.2	0.2	0.1	0.2	0.0	3.7	0.3	0.2
Band 9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non AfC	0.0	0.0	0.0	0.1	0.1	0.0	0.3	3.7	0.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: WEDS February 2015

As a result we combined the information in table 3.1 with data from others sources, such as population estimates from the Office of National Statistics, to crudely assess RNs per head of population. While differences in less densely populated LHBs such as Powys UHB may be expected, it is interesting to note the larger proportion of population per RN to be found within Aneurin Bevan UHB (Table 3.2).

Table 3.2: Registered Nurse Staffing (WTE - band 5 above) December 2014, by UHB mid-year population estimate 2013.

	ABM UHB	Aneurin Bevan UHB	Betsi Cadwaladr UHB	Cardiff & Vale UHB	Cwm Taf UHB	Hywel Dda UHB	Powys LHB	Wales Total
Population All Ages	520,710	579,101	691,986	478,869	295,135	383,906	132,705	3,082,412
%of Welsh Pop	16.9	18.8	22.4	15.5	9.6	12.5	4.3	100.0
Population 65+	99511	108024	148362	72793	53174	86048	32718	600630
%of Welsh Pop	16.6	18.0	24.7	12.1	8.9	14.3	5.4	100.0
Registered Nursing Staff (WTE - Band 5 & above)	2,652	1,796	2,883	2,010	1,242	1,581	184	12,347
Population per Registered Nursing Staff	196.3	322.5	240.0	238.3	237.7	242.9	722.3	249.7
Population (65+) per Registered Nursing Staff	37.5	60.2	51.5	36.2	42.8	54.4	178.1	48.6

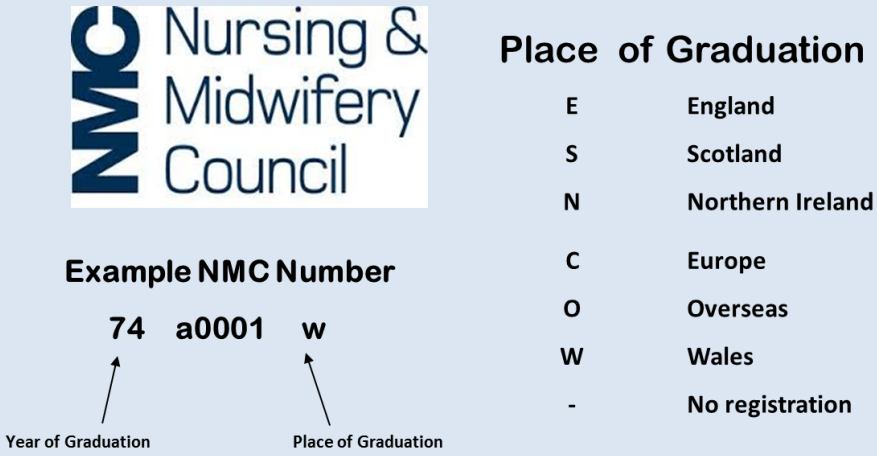
Note: This does not include nursing staff who work for the three all-Wales NHS Trusts (WAST, PHW & Velindre)

Mid-year Population Estimates for 2013, by Local Health Board in Wales
Source: Office for National Statistics

Nurse staffing 2014, by Local Health Board in Wales
Source: WEDS

The format of individual data variables can also be used to help inform understanding of nurse staffing in Wales. Each nurse registered through the Nursing and Midwifery Council (NMC) must have a valid registration personal identification number (PIN) to work in the UK. The format of the NMC PIN (summarised in Box 3.3) indicates the place of graduation (NMC 2015).

Box 3.3: Explanation of NMC PIN format



This can be used to show how many nurses who trained and graduated in Wales remain within the NHS (Table 3.3). The effect of overseas recruitment can also be examined, with a range of 5-18% of RNs employed having graduated overseas. Specific **data quality issues** (discussed further in section 3.4) are also highlighted; for example it can be seen that just fewer than 1 in 12 (or 8%) of RNs in Wales do not have a (valid) PIN within the ESR-DW.

Table 3.3: Registered Nurse Staffing (% - band 5 above) December 2014, by place of graduation and NHS Wales Organisation

Place of graduation	ABM UHB	Aneurin Bevan UHB	Betsi Cadwaladr UHB	Cardiff & Vale UHB	Cwm Taf UHB	Hywel Dda UHB	Powys LHB	Public Health Wales	Velindre Trust	Wales Total
Wales	55	68	73	64	84	74	38	67	74	68
England	7	14	20	15	4	17	52	33	18	14
Scotland	0	0	1	1	0	0	1	0	0	0
Northern Ireland	0	0	0	0	0	0	1	0	0	0
Europe	0	1	1	1	0	1	0	0	1	1
Overseas	10	13	5	18	7	8	6	0	1	10
No Reg	28	5	1	2	4	0	0	0	6	8
Grand Total	100	100	100	100	100	100	100	100	100	100

Source: WEDS February 2015

3.4 Data Quality in the ESR database system

The usefulness of any database is governed by the accuracy of information being entered into it. With large administrative data sets, it is important that there is some form of routine data quality checking process in place. In Wales this appears limited in contrast to England where data is produced and reported on a monthly basis compared to annual reporting in Wales (see section 3.2), which means that data anomalies can be identified more routinely.

The central ESR programme, hosted within the NHS HSCIC, has its own information and quality team which produce various products including a Business Intelligence (BI) reporting tool and the 'Workforce Validation Engine' (WOVEN). WOVEN is a monthly data quality validation report that focusses on key data fields within ESR, producing a score which highlights the occurrence of data errors to organisations, which also allows comparison between NHS organisations. WOVEN scores are sent to the 461 individual NHS organisations in England and Wales as a mechanism to encourage correction of data errors at source. It also provides a series of national rankings for data quality scores against an agreed list of criteria. These rankings, while not routinely published, are available on request from the NHS HSCIC. Despite attempts by the research team it has not been possible to gain a fuller understanding of the finer detail of WOVEN scores, for example in terms of what is regarded as an acceptable score and whether or how scores feed into service improvement initiatives around data quality.

However, as a result of our data request, it is apparent that there are wide variations in the data quality rankings between Welsh NHS trusts and LHBs (Table 3.4), with a difference of 320 places between the highest and lowest ranked (Lower ranking/higher final score indicates more data quality). Any future conclusions about "safe nurse staffing", which relies on administrative databases, need to be aware that data quality may be variable in Wales and the rest of the UK.

Table 3.4: WOVEN ranking December 2014		
	Final Score	Ranking
Welsh Ambulance Services NHS Trust	9990	41
Hywel DDA University LHB	9910	127
Betsi Cadwaladr University LHB	9870	138
Cwm Taf University LHB	8700	271
Cardiff and Vale University LHB	8645	276
Powys Teaching LHB	8525	282
Velindre NHS Trust	8090	298
Public Health Wales NHS Trust	7880	309
Abertawe Bro Morgannwg University LHB	7435	331
Aneurin Bevan University LHB	6525	361
source: HSCIC February 2015		

3.5 Example of specific data issues within ESR-DW

As already mentioned, Table 3.3 shows the differences in Nurses (AfC band 5 and above) who do not have a NMC PIN recorded within ESR. Averaged across Wales, the data within the ESR-DW demonstrates that 1 in 12 RNs in Wales do not have a NMC PIN, with 28% of RNs in ABMU falling into this category. We feel that it is highly unlikely that many of these RNs are working without a valid NMC PIN, its being much more probable that individual information has been entered incorrectly, or omitted from the ESR system. **Problematically however, there is currently no way of knowing** which of these two scenarios is actually the case.

This level of **uncertainty** could be detected or resolved by producing a regular time series report. It would then be a relatively straightforward process to retrospectively review data to check whether what appears to be an anomaly with NMC PINs is a recent or more long-term issue and any errors could be resolved at a much earlier stage. The absence of any regular (e.g. monthly) analytical reporting of data quality from the ESR meant that constructing our own time series analysis was outside the scope of this report and would have overly consumed our stretched resources. This rather obvious data anomaly **suggests**

two things; firstly that further, similarly obvious anomalies are undetected within ESR and secondly that less obvious and more subtle data anomalies that appear on first sight to be 'correct' have not been detected.

NWIS has launched the Workforce Information Systems (WfIS) programme whose aim is to 'standardise, streamline and simplify workforce process and enhance the quality of workforce information available to NHS Wales'. That these issues are apparent even with a brief examination of more detailed outputs from the ESR-DW indicates the scope of the task faced.

3.6 Staffing data from other sources

As discussed previously, staffing data are only accessible via direct request to LHBs or the ESR system. Time restrictions meant that we were unable to fully explore other possible sources of data, such as the Annual Population Survey or the Census for potentially useful information about the NHS workforce. Instead of pursuing all possible sources of data we instead focused on data sources that addressed questions regarding nurses and nursing care directly. For example, additional sources of workforce information are gathered by NHS Wales (NHS Wales 2013) and the Royal College of Nursing (RCN 2013[1]) who both conduct regular staff and member surveys, respectively. These are largely based on collating the views and opinions of staff/members on a range of topics relating to both clinical practice and the working environment; the key areas and themes are shown in Box 3.4.

Box 3.4: Key Areas and Themes in Staff Surveys

NHS Wales Staff survey	**RCN members Survey**
Theme 1: Overall job satisfaction and engagement **Theme 2:** Focus on quality and patient care **Theme 3:** Creating positive work climates **Theme 4:** Supporting staff through positive human resource management practices **Theme 5:** Ensuring effective team-working **Theme 6:** Building trust	The survey follows seven key areas •employment status and personal profile •pay, grading and career progression •pension arrangements •training •working hours •workload and staffing •views regarding nursing as a career

The usefulness of the results from both surveys is limited **by low response rates**. The most recent NHS Wales staff survey, with 22, 392 returned questionnaires from all NHS Wales staff (83 411), had a response rate of 27% (NHS Wales 2013). The UK-wide RCN Members Survey (RCN 2013[2]), with 9,754 usable responses from a non-specified sample of its membership, had a response rate of 14%. Retro-calculation using these published figures ((9753/14) x 100) gives a sample size of 69,671 (The UK membership of RCN is approximately 410 000). The Welsh-specific report of the RCN Members Survey (RCN 2013[1]) only reports total responses of 1,365 and gives no response rate.

3.7 Acquisition of ward level data from direct request to individual NHS Wales LHBs

Given the current inability of ESR to provide ward-level based nurse staffing information, we took the decision to ask Welsh LHBs directly for data to help us examine questions regarding access and availability of nurse staffing data. Given the narrow time frame that data were to be collected in, the **LHBs proved to be very helpful** in expediting data returns to us on 181 individual ward areas.

However, despite receiving the same data request template, LHBs' responses often varied, resulting in insights about **inconsistencies across Wales** in how LHBs collect and store nurse staffing data. Although each LHBs methods are undoubtedly useful for their own internal purposes, these inconsistencies result in **notable barriers to obtaining a full, or even partial, picture of national (All-Wales) nurse staffing levels**.

3.7.1 Data acquisition methods

Prior to data collection, the research proposal gained a favourable opinion from Cardiff University's School of Healthcare Science Research Science Review Committee and Research Ethics Committee. We also worked **closely in conjunction** with the All Wales Professional Nurse Staffing Group (AWPNSG) to develop an Excel-based data collection template (Annex 2). This was developed to acquire ward-area based information and comprised four sections; The Ward; Post & Costs, Shift Details; and Additional Information (see Box 3.5).

Box 3.5: Data Acquisition Template	
'The Ward'	– Generic details such classification/clinical specialty, number of beds, rostering, patient management and acuity tools used.
'Post & Costs'	– Required establishment and Actual Staffing, Vacancies, Bank and Agency Costs
'Shift Details'	– RNs & HCSW on Early, Late and Night Shifts, Bed Occupancy
'Additional Information'	– allowed UHB staff to report further detail/context

A census date of 10 December 2014 at 2pm was set as a reference point for shift-specific information, with a deadline for requests to be returned by 22 December. The AWPNSG asked for additional information requests to be included in the template, such as whether wards operated on a 24-hour basis, or had "surge beds" and the splitting of staffing costs by bank and agency were amended and included.

In total the following six Welsh LHBs were contacted by the study team: Abertawe Bro Morgannwg , Aneurin Bevan, Betsi Cadwaladr, Cardiff and Vale, Cwm Taf and Hywel Dda. Following discussion with senior nurses in Powys it was decided to exclude Powys from the exercise as it does not have any acute medical and surgical beds of its own. Data were requested on the condition of anonymity; as a result, individual LHB identifiers have been removed from this section of the report.

3.7.2 Key issues before acquisition process

One item of feedback regarding the format of the data template from these key stakeholders related to our use of the term "establishment". Feedback revealed **a variety of different definitions** around the term "ward-level establishment"[8] (see Box 3.6) and that we needed to use an explicit definition to ensure clarity and consistency of response. In response to this both the 'Required' and 'Actual' establishments were requested and we ensured that specific definitions were included on the data request template.

This shows how nurse staffing information is held in different ways to answer or inform specific issues regarding HR, payroll, finance and planning needs. However, the usefulness

[8] Our thanks to Paul Labourne, Assistant Nurse Director, Powys Teaching Health Board, for providing us with information about the term "establishment".

of this data and the effect of the number of definitions on making **clinical decisions** about safe nurse staffing on wards should be questioned, **as they seem to obfuscate rather than provide clarity for both researchers and, anecdotally to those in the NHS working closely on the issue of nurse staffin**g.

Box 3.6: Variation in establishment		
	Definition	**Unit**
Required Establishments	The total number of staff to provide sufficient resource to deploy a planned establishment that will meet the expected workload for a defined area.	*WTE per month* By Band to give skill mix
Planned Establishments	The number of staff planned to be deployed on a shift by shift basis to meet the known requirement of workload for a defined area. This can be taken from the planned roster and added up for a month, giving WTE by band and month	By Band by shift information to give *WTE* by Band per week or *per month*
Contracted Establishments	The number of staff contracted to work to cover a defined area.	By Band by *WTE per month*
Budgeted Establishments	The number of staff funded to cover a defined area.	By Band by *WTE per month* and cost.
Actual Establishments	This is the number of staff who did work to cover a defined area.	By Band by shift information to give *WTE* by Band per week or *per month.*
Paid Establishment	This is the number of staff paid to work in a defined area (usually by budget code)	By Band by *WTE per month* and cost.

3.7.3 Level of response to our data request

After excluding duplicates, emergency departments, specialist units, and Medical and Surgical assessment units, we were left with information relating to **181 individual acute medical and surgical ward areas**. When combined, this helps to produce a detailed picture of nurse staffing in Wales. We do not claim this to be an exhaustive data set of all medical and surgical wards in Wales as there may potentially be areas that were not included in LHBs' returns. It does, however, indicate that a **significant volume of nurse staffing data can be gathered in a fairly short time**.

We were frequently **reminded at the outset by fellow researchers and** NHS employees that **obtaining more than a handful of data returns on a ward by ward basis would be a tough undertaking**. However, the **helpfulness of NHS staff and the resourcefulness of researchers proved that it was possible to collect a relatively large amount of data within**

a tight timeframe. We hope that future research projects **are designed and funded** whilst keeping in mind the ability demonstrated here by academic researchers to build liaisons and collaborations with NHS and government staff that help significantly with data retrieval. As is nearly always the case with research studies more time and more funding could have enabled a more in-depth study. As already discussed our attempts to map any historical trends in NHS nurse staffing data was stymied by a lack of time to pursue data sources, although initial enquiries suggested there were few sources available. Much of the data raised more questions than answers and these have been presented in the recommendations as future priority areas for research.

In the absence of any evidence to the contrary **we believe this to be the most comprehensive and detailed volume of nurse staffing data** in existence for nursing across Wales. It is somewhat **surprising that this is the case**, given that nursing is the single largest employee group in NHS Wales, consuming a large amount of the NHS budget, and the strong association between nurse staffing levels and patient safety outcomes.

3.7.4 Checking and quality of staffing data returns

Each LHB's submission went through a process of consolidation and checking to produce a single file. Each LHB was contacted in February 2015 to check they were satisfied with how their data returns had been processed and, where appropriate, questions were posed which had arisen through this process for further clarification. As a result of feedback from the LHBs further changes were made to data previously submitted. However, two LHBs did not respond to these additional requests for checking therefore their original data submissions were used (where relevant we have identified these datasets in the results that follow).

Regardless of our attempts at clarification and applying some changes to the original data based on feedback, **the task of making comparisons across the whole data set has still proved problematic**. As a result while there were 181 individual ward area returns, this did not mean that for each variable collected there were 181 comparable responses.

3.7.5 Variation in response to the data request

There were key variations in data returns that clearly indicate some of the issues around accessing an accurate picture of ward-level nurse staffing information within NHS Wales.

Our perception (further explored below) was of **the absence of an individual or team with responsibilities** for routinely collating and reviewing ward nurse staffing data in some LHBs proved puzzling and a barrier to timely data access. This was particularly surprising given the vast scale and costs associated with the nursing workforce in the NHS and the recent high profile discussion of nurse staffing levels as a quality issue following the publication of the CNO's All-Wales Nurse Staffing Principles (National Assembly for Wales 2013), the Francis Report (2013) and the "Trusted to Care" Report (Andrews & Butler, 2014), as well as large investments for nurse staffing made by WG, to name but a few.

Given nurse staffing's high profile, we had a **naïve expectation** prior to project commencement that nurse staffing data would be **routinely collected**, generating detailed analyses and thus available with little or no effort. The **reality proved very different**, which was problematic for researching purposes but also poses **profound questions about data access and availability** within LHBs for **important decisions** regarding nurse staffing on a day-to-day basis, as well as regarding more medium and long-term nursing workforce planning issues such as recruitment. The House of Commons Health Select Committee "After Francis" report recently argued for the routine data display of each hospital ward's ratio of clinical staff to patients (Health Select Committee, 2013). Our study suggests that LHBs would struggle to provide robust, real-time data of this nature, with a similar conclusion recently being reached following a review of NHS staffing in England (Hockley & Boyle, 2014).

Without robust data, developing a proper understanding of the pressures on the nursing workforce as a basis for change will be extremely difficult. The paucity of such data affects healthcare in Wales at all levels, from nurses on the wards to policy makers in Cardiff Bay. In a safety critical industry knowing who is available in real time and having a verifiable record of staffing levels should be a top priority.

Regardless of our attempts to iron-out potential problems in advance of data collection by arranging preparatory discussions with LHBs through attending national nurse staffing meetings, email communication and visits to individual Health Boards half of the LHBs provided a single data submission. Other LHBs provided data in individual batches of e.g. 8 to 10 wards or, in one case, 13 individual submissions including duplicates which had to be identified and removed. However, we are grateful for the time and support provided by the LHBs as the issues identified above has made us acutely aware of how difficult and complex data access and collection would have been without their cooperation.

As already touched upon, there were different interpretations of which data were being asked for and the format of how they should be entered into the data template. Table 3.5 depicts information for two wards drawn at random for each of the six health boards. The table illustrates how an agreed and relatively standard data template led to different local interpretations in the format of how staffing data were expressed; for example, as Staff Headcount, Staff Whole Time Equivalent (WTE) and total hours worked expressed as WTE. Also, some job vacancy and bank & agency cost fields were left blank so it is unclear if the values are zero or missing. There were also instances of LHBs changing the agreed data template, inserting additional columns/variables, and including written responses and annotations within numeric fields.

The apparent absence of reliable and standardized systems to record nursing numbers on all hospital wards in Wales represents a potentially serious flaw in the system, potentially affecting efficiency and any claims made about safer levels of nurse staffing.

When compared to many other employers it seems that the NHS has fallen behind the times, particularly in those industries in which the presence of qualified staff plays an important role in the delivery of safe and effective services (Hockley and Boyle, 2014). Whilst many of the hospitals and LHBs have moved towards electronic systems for staff rostering (at least for nurses) the lack of connection and standardization of systems (seen in table 3.4) within and across LHBs remains a serious barrier to answering relatively straightforward questions regarding nurse staffing. This without even attempting to compare ward and hospital level staffing data to patient safety outcomes data which, as

covered in the REA section, is itself a source of data in need of standardization and hampered by data validity and reliability issues.

Table 3.5 : Example of 2 wards data retuned for 'Post&Costs' by LHB

	Req **RN** Estab Day	Actual **RN**	Actual Bank/ Agency **RN**	Req **HCSW** estab day	Actual **HCSW**	Actual Bank/ Agency **HCSW**	Req **RN** Estab Night	Req **HCSW** Estab Night	HCSW Job Vac Band 2	HCSW Job vac Band 3	HCSW Job vac Band 4	RN Job vac Band 5	RN Job Vac Band 6	RN Job Vac Band 7	**Annual** Bank Costs 2013/ 2014	**Annual** Agency Costs 2013/ 2014
LHB 1*	4	2	1	3	2	0	3	3	0	0	0	5	0	0	51,115	177,389
	12	16	0	5	6	0	5	1	0			0.8	0	0	79,339	153,154
LHB 2	0.96	1.60	0.00	0.96	1.60	0.32	0.64	0.96							111,221	34,704
	0.96	1.28	0.32	0.96	0.96	0.48	0.64	0.80	1.00				2.80		56,613	42,977
LHB 3	15	14	0	5	3	0	4	2	0	0	0	1	0	0	17,709	0
	10	8	0	7	6	0	3	3	2	0	0	4	0	0	96,455	3,885
LHB 4	7	2.24	0.64	3	1.92	0	3.5	2	0.58	0	0	1.66	0	0		
	6.5	2.4	0.32	3.5	1.28	0	3.5	2	0.3	0	0	1.7	0	0		
LHB 5*	4	5	1	3	2	3	2	2	5	0	0	1	0	0	80,344	11,107
	4	4	2	3	3	2	2	2	4.8	0	0	2	0	0	71,241	8,913
LHB 6	4	2.2	0	3	0.86	0	3	2	0	0	0	2.2	0	0	69,609	6,954
	3	1.13	0	2	0.66	0	2	2	0	0	0	0	0	0	22,724	2,560

* LHB did not respond to requests for secondary data checking

3.7.6 Variation in ward structure and shift pattern

The number of beds present on each ward was requested, **demonstrating that there was a considerable range with the largest ward being 5 times the size of the smallest (8 to 40 beds).** The structure of the ward, such as bay size, whether there were individual rooms etc. was not asked for but is an important factor that should be required in future work and when considering nurse to patient ratios and skill-mix. Within the bed number data-field, LHBs often annotated responses with details of additional trolley beds, escalation beds and day beds. Such temporary beds (often referred to as "surge") are an important resource at busy times. However, the extent to which nurse staffing numbers are planned and "flexed" upwards to cover transient use of beds was unclear and is an important question to revisit as it was beyond the remit of this project. Across 36 ward areas where the LHBs reported the use of temporary beds, a total of **114 surge or flex beds were in operation.**

Ward areas were asked to make a note of bed occupancy at 2pm on 10 December 2014 (2pm was the time chosen following consultation with the Wales Nurse Staffing Group). While five of the six LHBs complied with this, one LHB (for reasons which are unclear) provided bed occupancy at 12pm. Bed occupancy was reported both as the number of beds occupied and the percentage of beds occupied, using the number of beds in each ward, allowing a consistent variable series to be created. **The average bed occupancy was 97%, with 137 of the 181 ward areas operating at 100% or more.** Where ward areas report bed occupancy at above 100% suggests that they are including 'surge' or 'flex' beds in their calculations. **Average bed occupancy by LHB ranged from 92% to 100%.** We intended to use this measure as a proxy for patient numbers. However **we advise that caution be exercised as we could not take into account bed throughput/patient turnover**, i.e. the number of patients being admitted into the same bed in the same day, where a high turnover of patient would involve greater levels of clinical and administrative work than a ward area with more static bed occupancy.

It's also important to note administration, recognising that nursing work extends far beyond direct patient care activities signified by bed occupancy levels. As Allen (2015) points out, nurses across the wide spectrum of locales in which they are employed support and sustain the delivery and organisation of health services in numerous, but often invisible

ways. In terms of the nurse staffing debate, which normally and rightly focuses on direct patient care this wider work of nurses has generally been regarded as at best an adjunct to the core nursing function or at worse responsible for taking nurses away from their 'real work' with patients or altogether ignored. Ward visits for patients returning for minor procedures, such as wound checks or suture removals are also a hidden but time-consuming aspect of nursing work. Other invisible or hidden work in the staffing debate such as patient throughput, ward attendance by non-inpatients and temporary/surge beds are prevalent on many wards but **seldom included in the reckoning about nurse staffing numbers.**

Our data also provide an interesting insight into different **shift patterns** found at ward level. All the ward areas included in the report operated on a 24-hour basis. However, the way in which shift patterns operate varies, with combinations of early/mid/late shifts and short/long shifts, for example. Discussions with senior nurses revealed that nurses would sometimes work shifts of three to five hours in duration, to cover the busiest time of the day. This raises a key issue for adherence to the CNO's staffing principles and to ratios more generally. For example, the question might be asked whether a 1:7 RN–patient ratio **is consistently met throughout the day** (Section 1 of the staffing Bill mentions the "provision of safe nursing care to patients at all times") where, for example, RNs on one ward are working a mixture of short and longer shift patterns.

Unsurprisingly, this illustrates that ward areas are not homogeneous; they vary by nature of their size, their shift pattern and bed occupancy. Such differences make comparison for researchers working with raw data difficult without presenting misleading results. It also demonstrates the difficulty of producing meaningful fixed staffing ratios within ward environments that have complex staffing arrangements and nursing work that is very difficult to capture.

3.7.7 Variation in decision-making resources used

Ward areas were asked to indicate what software tools, if any, were used to inform staff rostering and patient management. As a result we found at least four different electronic rostering systems being used across Wales, with 7% of ward areas not using any electronic rostering software. There was a similar range with the use of at least four different patient

management systems reported. It is unclear how well such systems interact both with the ESR system and with each other; this is important as different software systems were reported as being used both at LHB and ward level.

It was also apparent during data collection and discussion with LHBs that much faith was placed on rostering systems providing an accurate and consistent representation of the actual numbers of nurses on duty on a ward at a particular time. Less apparent was the view that a roster should be seen at best as a forecast of ward staffing, and that many factors could affect the delivery of the roster on a ward-by-ward, minute-by-minute basis. The Keogh report (2013) examined unannounced visits to hospitals and noted that reported data on nurse rostering systems did not provide a true picture of numbers of staff actually working on the wards. The report mostly picked up on insufficient nursing establishments, although data discussed later in this report show how nurses are also overworking their hours to cover workload demand on wards across Wales.

3.7.8 Adherence to Wales CNO staffing guidance

It is important to note that the following results are produced within the limitations already raised throughout this report in relation to the variation and inconsistencies shown to exist and the probable impact these may have on the accuracy of any findings presented.

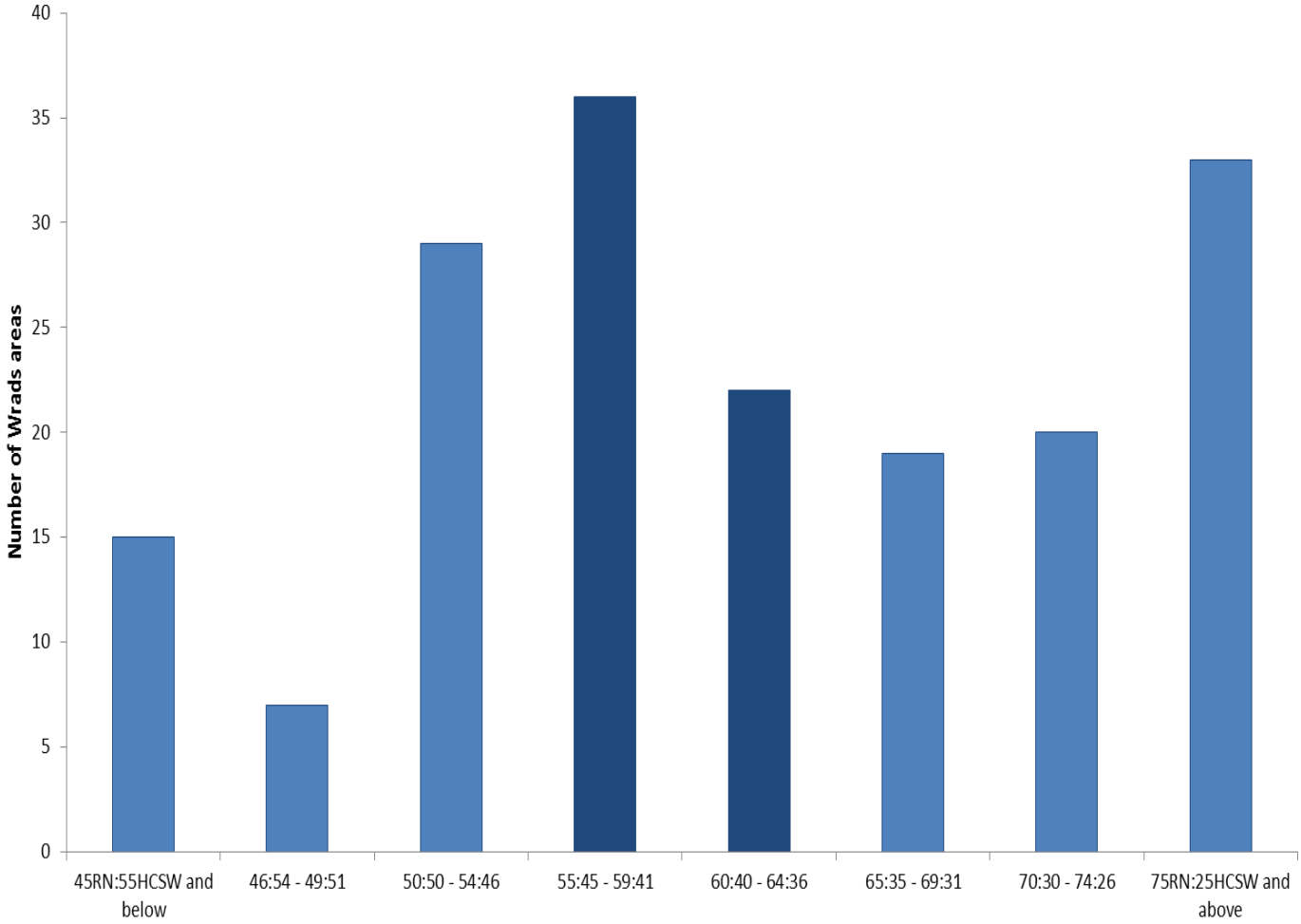
60:40 RN:HCSW ratio.

Despite the format for staffing being retuned in a number of ways, the RN:HCSW ratio could be calculated for all 181 ward areas as whatever format used was similar for RNs and HCSWs in a ward area. Of the 181 ward areas, 87 were under the 60:40 ratio recommended in the CNO principles. However, this is a particularly crude approach. For example, it combines wards that are very close to the guidance (e.g. with a ratio of 59:41) and wards with much lower ratios.

For a more informative comparison, each ward area was placed into a broad group on the basis of the reported RN:HCSW Ratio (Fig 3.2). This shows that many wards were closely grouped around the recommended ratio, with more wards being on or over the recommended RN:HCSW ratio than under, although over 80 wards operated under the

recommended ratios. Although there was a considerable range across the data set there may be valid reasons why such diversity occurred. When looking at night RN:HCSW ratios, a ward area with a ratio of 100:0 was identified. Expecting this outlier to be an error, upon checking with the LHB it was found that this was in fact correct. Relating to a 14 bed ward with two RNs on the night roster, the LHB staff felt it unnecessary to have a HCSW as well. Despite having a night nurse patient ratio of 1 to 7 (if the ward was at 100% bed occupancy), this RN:HCSW ratio, while not adhering to one of the CNO principles, was a good example of how professional judgment was used well.

Figure 3.2. Grouped RN:HCSW ratio by number of ward areas (n=181)

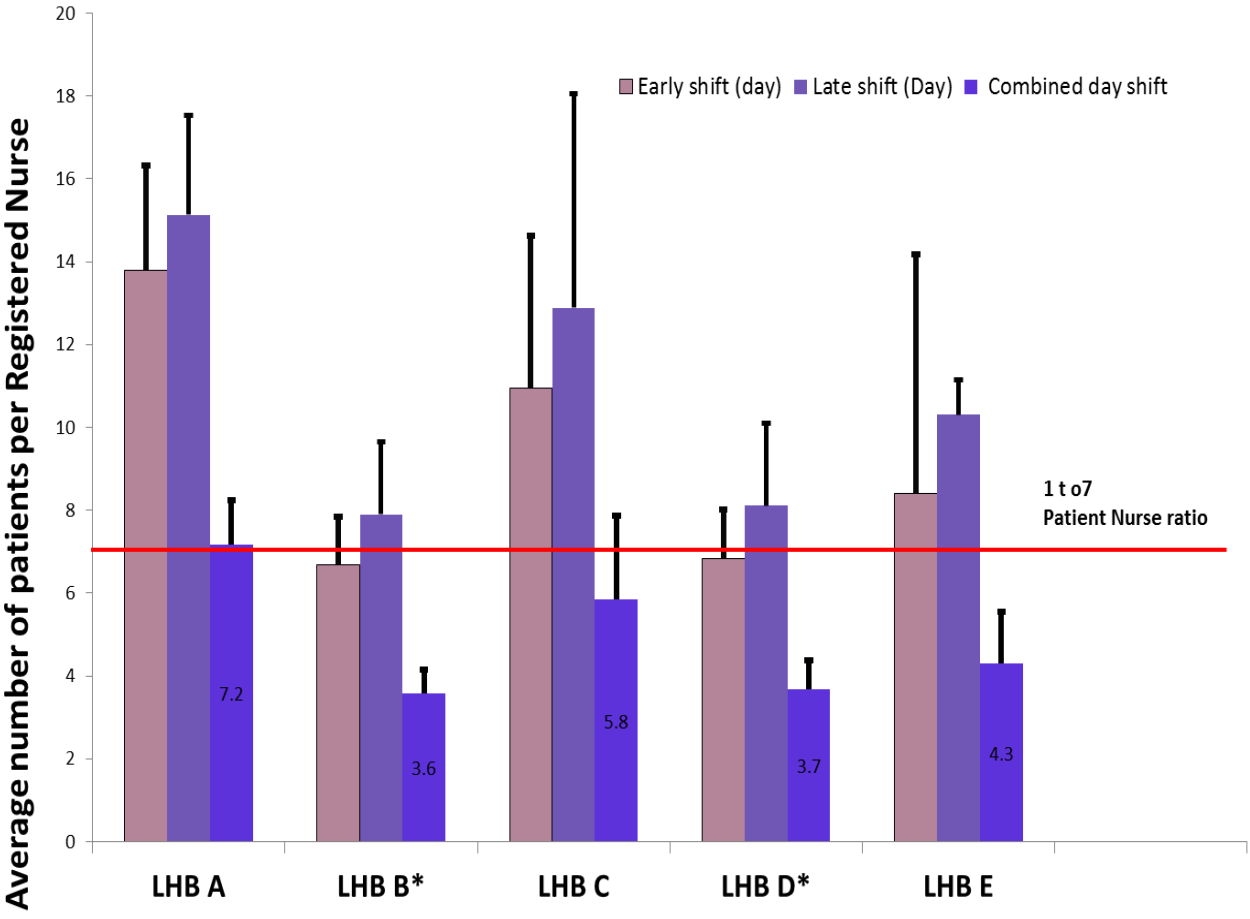


- **1.7 Nurse-to-patient ratio during the day**

We selected ward areas with 100% bed occupancy and then excluded any that identified

RNs on other shift patterns that did not match early/late shifts or for which we did not have confidence in how the nurse staffing level was being reported. This produced a sample of 79 ward areas within five LHBs where it was possible to calculate the average number of patients per registered nurse by early day shift, late day shift and combined day (Figure 3.3). It is not surprising, given what has previously been described, that there is considerable variation within and between the LHBs with the average number of patients per RN for a combined day ranging from 3.6 to 7.2. The error bars indicate the extent of intra-UHB variation in the numbers of patients allocated to an RN. For example, although the "day average" allocation of patients to a RN in LHB C is 5.8, the error bar indicates that on some wards over the course of the day the ratio of RN to patients was 8, which is a ratio that is considered to be unsafe and putting patients at risk (National Assembly for Wales, 2013).

Figure 3.3: Average Number of Patients per Registered Nurse on early shift, late shift and combined day, by LHB.



* LHB did not respond to request for secondary data checking

It is interesting to note that when, based on the data the LHBs have provided us with, RN numbers over both day shifts (early and late shifts) are combined, each of the LHBs, apart from LHB A which is marginally over, are compliant with the All-Wales Nurse Staffing Principles which states that 'the number of patients per registered nurse should not exceed 7 by day' (National Assembly for Wales, 2013: 1).

However, when numbers of RNs are distributed by the shifts they worked (early and late shifts, including those nurses working both early and late shifts during a 12-hour shift) a very different picture emerges that shows RN to patient ratios well in excess of the CNO Staffing Principles in some areas. For example, one ward with 28 beds had four RNs working over the whole day, two on an early shift and two on a late shift. The "day average" ratio of RNs to patients is 1:7, whereas the shift by shift ratio is 1:14. The only time where the ratio was realistically at a ratio of 1:7 was during the change around of shifts, when both early and late shift nurses were present on the ward for handover report (and by consequence not providing direct patient care). The salient point to draw from this example is that simply reporting staffing ratios, without providing an understanding of contextual data about shift patterns, is of dubious relevance in answering questions about safe nurse staffing ratios.

- **"Additional information" section: ward sister/charge nurses being counted in ward numbers**

One of the CNO's core All-Wales Nursing Staffing Principles states that 'the ward sister/charge nurse should not be included in the numbers when calculating patients per registered nurse'. Compliance with this core principle **was highlighted as an issue** by three of the LHBs in the "additional information" section of the data template. The common theme was that ward sisters/managers were **included in staffing numbers** (sometimes referred to as "establishment") even though organisations realized this was not desirable. Low staffing numbers was the identified cause in some of the responses (see comment 2 and 3 in box 3.7).

Interestingly, it appears that regardless of whether there is a staffing shortage on a particular shift or not, some organisations have **"local agreements"** regarding the ward sister/charge nurse's being counted in the numbers, albeit only for some of the working

week. For example comments 1 and 4 indicate that ward sisters/managers are included in the staffing numbers, although making no reference staff vacancies or shortages (as comments 2 and 3 do). This may indicate that ward managers are routinely included in the numbers to satisfy the requirement of meeting the required target of RNs on duty, rather than being driven by patient care demands. Comments 2 and 3, on the other hand, indicate local "agreement" has been reached to cover staff shortages, agreements which stipulate sisters/charge nurses are counted in ward staffing numbers for "50% of their working week" (comment 2) or have "2 days out of the week as supernumerary", thus being counted in ward numbers for 60% of the working week or three days.

Box 3.7 Additional information about ward sister/managers and staffing

Comment 1 - *'The WTE staffing hours include ward sisters who do not contribute 100% of their working time to clinical care'*

Comment 2 - *'Agreement has been reached for the ward managers to be included in the establishments for 50% of their working week however due to vacancies etc. the ward managers are 100% in the establishments. For the past 3 months.'*

Comment 3 - *'It has been agreed that ward managers have 2 days out of the week as supernumerary to carry out management duties. However due to staffing levels this is not achievable at this present time.'*

Comment 4 - *'Ward managers are usually included in the numbers and this means that they do not have protected time to undertake managerial duties.'*

The problem potentially when including ward sisters/charge nurses in staffing hours is that, as comment 1 suggests, ward managers are not always available to contribute to clinical care. This means that the ratios of RNs to patients providing direct care is overinflated and thus misleading. This would be particularly worrying on wards that are operating close or over the 1:7 ratio of RNs to patients, or in the wards that are currently struggling to meet the 60:40 ratio of RNs to HCSWs (see figures 3.2 and 3.3). Research evidence strongly suggests that patient outcomes are compromised when both skill mix and nurse-to-patient ratios slip beyond these ratios.

The comments also resonate with some of the discussion in the REA section of this report that touched upon nursing staff shortages on wards in Wales and the potential effect of mandatory staffing levels on bank and agency costs. Within the context of the earlier discussion we also touched upon evidence from staffing surveys and our own data that

suggest that it is not always possible to source bank and agency staff in Wales either through lack of available supply of temporary staff or financial constraints. The routine deployment of (purportedly) supernumerary ward managers may provide further testimony in favour of an argument that some hospital wards are currently struggling to achieve safe levels of staffing. It is also salient to point out that a mandate to enforce minimum nursing numbers alone does little to address the issue of supply of nurses.

The REA section also demonstrated how nurses felt pressured ("emotionally blackmailed" was the term used by one participant in a RCN 2013 staffing survey) to work overtime (paid or unpaid) to cover for staff shortages. Against this backdrop of high demand, recommended staffing ratios and the need for safe patient care it is worth pointing out also that comments 2 and 3 include the word "agreement" or "agreed" and it is interesting to speculate who within LHBs these local agreements are brokered and agreed with and the extent to which nurses contributed to these negotiations, if at all.

3.7.9 Additional staffing factors

Numbers for agency and bank staffing were combined in the data request template so it is not possible to represent differences between these two types of staff. As a result we resort as others have to the term "temporary staff". On the census day (10 December 2014), 63 ward areas had temporary RNs, 89 ward areas had temporary HCSWs and 40 ward areas had both. Furthermore 136 ward areas had RN vacancies and 73 had HCSW vacancies, suggesting that even though there was a large use of temporary staff the need may be even greater and may explain the counting of ward managers in the numbers as reported in the previous section.

We find the lack of detail about whether temporary staff consist of bank or agency employees surprising, given that several millions of pounds are spent annually on bank and agency staff. For example, more detail would be useful from a financial point of view as bank staff are normally cheaper to employ per shift. Additionally, from a quality of care point of view existing members of the employing organisation may prove more adept at adjusting to the demands of wards than agency nurses, who may never have worked in the organization previously.

4.0 SUMMARY

Our task in the latter part of this report was to establish current data that are available on nurse staffing levels in adult acute wards. The pragmatic approach we adopted reflects the restricted time and resources allocated to the project, in light of which we remind readers of the study limitations discussed earlier in the report. However, given the shortage of time and resource we have still discovered much about nurse staffing data in Wales.

One of the main findings was that ward nurse staffing data in Wales are not easily available or accessible to those from outside the NHS such as researchers or the public. In addition, there appears to be no centralised, accessible store of hospital ward nursing data available to senior nurses in the NHS who have current managerial and/or operational remits that cover nurse staffing. As a result of the lack of centralisation our data request templates, in many instances, were conveyed by senior nurses to individual ward managers to complete. Considering that many wards are busy enough to require ward managers to lose their supernumerary status (as per CNO principles) the lack of a functioning information system that releases ward managers from undertaking a manual headcount of nurses each time a question about nurse staffing is asked is surprising and overdue.

When data were returned we found that there to be a lack of standardisation of information about shift patterns or terms such as establishment, making meaningful comparisons within and across hospitals difficult for researchers and, in all likelihood, practitioners and policy makers. The lack of centralised data collection and storage also meant that early in this study we realised that any attempt to answer the original tender question regarding historical trends in ward nurse staffing numbers would prove impossible to answer within the timeframe. Even with a much-extended timeframe we remain unconvinced that data exist that would allow us to answer the question.

It appeared to us that some NHS organisations in Wales struggled to answer the relatively basic question of how many nurses, registered or non-registered, were on duty at any one particular time. The difficulty answering such a question makes the task of drawing any conclusions about the relationship between nurse staffing levels in Wales and patient safety outcomes extremely difficult, especially as the evidence review demonstrated that a clear causal link between nurse staffing and patient safety outcomes are difficult to

establish even where studies draw upon nurse staffing data that are standardized and of a high quality. However, we do know from the review that several studies suggest that a RN caring for more than seven patients is considered to be the point where increased risk of harm to patients occurs. Our analysis of the data suggests that the 1:7 RN to patient ratio threshold was breached on several wards across Wales on the day of data collection.

The study recommendations, which conclude the report, draw on our learning from both the rapid review and data analysis. Although separated into recommendations for practice and research the demarcation between these two areas is somewhat specious, as robust research can quickly influence nursing practices in Wales and vice versa.

The recommendations fall under the theme of “Sensitivity to operations”; a term used by high reliability theorists to describe a workplace culture that permits early identification of problems so that actions can be taken before they threaten patient safety. Organisations and teams that exhibit sensitivity to operations deploy resources and have measurement systems in place that enable people to see what is happening and understand its significance and potential impact (Vincent, Burnett, & Carthey, 2014). Our recommendations are also made in an attempt to move beyond the rather stagnant literature and debate that only focuses on staffing numbers or ratios towards a debate that leads to better understanding of how hospitals and their largest workforce can improve care that patients receive.

5.0 RECOMMENDATIONS

Recommendations for practice:

1. In line with Welsh Government's commitment to transparency and improved access to NHS information we recommend monthly reporting of accurate and robust ward level nurse staffing data across NHS Wales that is publically available. This recommendation will bring NHS Wales in line with recent improvements in nurse staffing reporting elsewhere in the UK.
2. The analogy of nurse staffing data as a "smoke alarm" is useful as it may provide an early indicator of patient safety problems. However, nurse staffing data are currently held and used as separate information sources by finance, human resources and nursing teams, for example. These data sources should be linked and combined with "real time" ward information to form a "nurse staffing safety dashboard". Such a dashboard would prove a valuable resource from "hospital wards to boards" to anticipate and prepare for problems in a way that our experiences of data collection and analysis suggests is not the case at present (for example section 3.75).
3. Regardless of Welsh Government investment in nurse staffing and training places our data suggests that some wards routinely have lower numbers of nurses per shift than is desirable (for example section 3.78). Enhancing data accuracy methods about the "churn rate" (a measure of the number of individuals moving out of a collective group over a specific period of time) of students and nurses and use of temporary staffing would help ensure greater political and public confidence that workforce investment strategies are increasing numbers of current numbers rather than merely replacing nursing staff that have left the NHS, or about to.
4. Evolve the CNO's staffing principles along the lines of recent and promising innovations in nurse staffing methodologies in the USA, such as the Nurse Staffing Committees and Nurse Staffing Plans discussed in the evidence review. These move away from merely focusing on ward staffing in terms of numbers in isolation by embracing a more multi-disciplinary approach to staffing that empowers frontline nurses to participate in decision making about staffing levels and skill mix.
5. The evidence review suggests that patient safety does not lie solely with the nursing

workforce, but also in the support staff and other professionals who provide critically important services. More regular, detailed and open publication of nurse staffing and broader NHS workforce data by NHS Wales is recommended by making better and fuller use of ESR-DW.

Recommendations for research:

1. Specifically in relation to this study a follow-up study is needed to revisit the data and work closely with LHBs, hospitals and individual wards to better inform a more complex understanding of some of the notable anomalies and points of curiosity within the data set such as the use of “flex” or “surge” beds and the inclusion of ward managers in ward staffing numbers.
2. More in-depth, rigorous qualitative studies of nurse staffing, ward staffing more generally and the availability of other resource such as equipment. A much richer, three dimensional sense of the world of nursing and healthcare work in NHS Wales can be achieved by asking the “why” and the “how”, not just the “how many”.
3. More studies are needed on the relationship between nurse staffing levels, patient outcomes and patient acuity during times of the day, week and year.
4. Further exploration is needed to better understand the effects of staffing levels on broader workforce factors such as staff wellbeing, staff retention and intention to leave. Opportunities exist here to bring together “big data” quantitative approaches and qualitative approaches that address questions related to these issues and safety outcomes.
5. Studies to better understand marked variation in temporary staffing usage on wards that are similarly staffed and face similar demands such as unfilled vacancy, patient acuity and turnover.
6. Studies that better understand the motivation of nurses to work as temporary staff members and their experiences of temporary working. These can feed into strategies that may result in converting temporary staff to permanent staff whilst also better understanding how to get the best out of temporary staff who work for the NHS.
7. Health economics analysis should, where relevant, become a routine aspect of research into nurse staffing.

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Annex 1 Rapid Evidence Appraisal methodology

The Rapid Evidence Appraisal sought to answer the following questions:

- What are the approaches used to set and monitor nurse staffing levels in the UK and beyond?
- What are the strengths and limitations associated with different approaches to setting and monitoring staffing levels?

Search engines such as PubMed, CINAHL, Web of Science and the British Nursing Index were utilised to locate relevant papers published between 2004 and 2014 in the English language. Keywords included 'nurs* staffing', 'nurs* staff' with 'ratio*'. Due to the large volume of research papers identified (2,578 hits) and the project's limited timeframe, effort was placed in identifying the most relevant papers on nurse staffing levels and ratios. 243 papers were identified that contained nurs* and staff* in the title and referred to ratio* as a topic. The references were stored, managed and shared with the reviewing team in a bibliographic database (Endnote).

All abstracts were reviewed by two members of the project team and considered against the inclusion criteria which consisted of:

- Approaches taken to setting and monitoring nurse staffing levels in the UK and beyond;
- the role played by nurse staffing levels in influencing patient safety relative to other factors;
- the range of approaches in place in different countries to set nurse staffing levels;
- including the use of legislation;
- the strengths and limitations associated with these approaches, including their use in a community setting;
- practical issues in implementing such measures and how they are monitored;
- consideration of the evidence for staffing level 'tools' in supporting or informing decision making on staffing levels.

A total of 87 studies met the inclusion criteria and were divided between and read in full by a team of 5 reviewers with relevant expertise in qualitative, quantitative, workforce and economic health and social care research. The economic analysis is based on the appraisal of 12 published articles. Relevant cost and economic terms were added to the search strategy to identify documents which include an economic component. Following feedback following the full reading of papers

Reports of service developments, case studies and non-research materials found in the 'grey literature' were also searched for from sources including OpenGrey, the HMIC and Index to Theses databases, relevant key organisations' websites and Google Scholar. Key journals reflecting the focus of our review (for example, International Journal of Nursing Studies, BMJ Quality and Safety) were isolated and directly searched for relevant papers. Studies identified via 'back-chaining' from reference lists were assessed for relevance based on publication titles. A total of 76 reports were identified which included 54 articles and opinion pieces in the professional nursing literature, 18 UK policy reports and 4 unpublished literature reviews. Information from the grey literature was used to contextualize the nature of the academic debates and identify how policy and research interrelated.

Information from included studies from the academic literature was entered onto a 'data charting form' using the database programme Excel. The form consisted of a mix mixture of general information about the study and specific information relating to, for instance, the study population, geographic location, the type of intervention if any, outcome measures employed and the study design. Studies were also assessed for quality and impact in order to identify 'key influencers'. Each research report that passed the initial topic inclusion screening process was assessed independently for methodological quality using the design-appropriate checklists, such as those produced by the Critical Appraisal Skills Programme (CASP).

Annex 2 Data collection template

We have been commissioned by the Minister for Health and Social Services to undertake an evaluation of nurse staffing levels in acute in-patient adult medical and surgical wards in Wales. The project has received full research ethics and governance approval. To minimise disruption we intend to collect routinely held data, no new data will be generated.

We have created a datasheet which sets out in detail the information that we need to collect.
This consists of 4 sheets: **The Ward; Posts & Costs;** and **Shift Details.** The final **"Additional Information"** sheet is there for you to provide any information or data that you feel would add further detail and/or context to the data.

The census date for this data capture is the **10th December**. The date has been chosen at random. Please can you complete the data collection template, where relevant, for this day only. **Completed templates to be returned by 22nd December** to Aled Jones at the email address below**.**

The project will inform debates within Senedd in 2015 around the introduction of minimum levels of nurse staffing in Wales. This is an important opportunity for your organisation to contribute to this debate. The project will also support and contribute to the excellent work into better understanding nurse staffing already undertaken by Health Boards across Wales.

Your cooperation is very much appreciated.

Professor Daniel Kelly & Dr Aled Jones
Cardiff University

Name of person completing the form:

Health Board:

Census Date: 10th December

Notes.

1. Please label each ward as they are known within your organisation.

	To be collected 10th December 2014								
Ward Area[1]	Classification (medical/surgical)	Ward Active 7days week/24hr day (Yes/No)	No of beds	No of additional beds in use e.g. Surge Beds	Electronic Rostering tool used? (Y/N)	If yes, what software?	Electronic patient management system used?	If yes, what software?	Acuity Tool used? (Y/N)

Name of person completing the form:
Health Board:
Census Date: 10th December

Notes.

1. Please label each ward as they are known within your organisation.
2. We define the **Required Establishment** as 'The total number of staff to provide sufficient resource to deploy a planned establishment that will meet the expected workload for a defined area'.
3. We define **Actual** as 'the number of staff who actually worked in the defined ward area and does not include staff who were out of the area due to other activities e.g. leave, study or sickness, but **does** include additional staff such as bank or agency'

	To be collected 10th December 2014														Financial Year 2013/2014	
Ward Area[1]	Required Nursing Establishment[2]		HCSW Establishment[2]		Actual[3] **HCSW**	Actual[3] **RN**	Actual[3] Bank/ Agency **HCSW**	Actual[3] Bank/ Agency **RN**	Number of Job Vacancies (**HCSW**)			Number of Job Vacancies (**RN**)			**Annual** Bank Costs	**Annual** Agency Costs
	Day	Night	Day	Night	(WTE)	(WTE)	(WTE)	(WTE)	Band 2	Band 3	Band 4	Band 5	Band 6	Band 7	(£)	(£)

Name of person completing the form:

Health Board:

Notes.

1. Please label each ward as they are known within your organisation.

	To be collected 10th December 2014								
Ward Area[1]	Bed Occupancy at 2pm on 10/12/14	RNs (early shift) (WTE)	HCSWs (early shift) (WTE)	RNs (Late shift) (WTE)	HCSWs (late shift) (WTE)	RNs (night shift of the 10th December) (WTE)	HCSWs (night shift of the 10th December) (WTE)	RNs on other shifts (WTE)	HCSWs on other shifts (WTE)

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We would also like to thank Dr Susan Barker, School of Healthcare Sciences, Cardiff University, for diligently reviewing papers for the REA stage and contributing to our group discussions on the quality of the literature.