

# **Integrated Hospital-to-Home Care for Older Adults in England**

A Master's-Level Health and Social Care Study of Discharge Governance, Virtual Wards, and Readmission Risk

**Research Publication by Patsy Theokalio**

**Institutional Affiliation:**

New York Center for Advanced Research (NYCAR)

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## **Abstract**

Older adults moving from hospital to home sit at the point where health care, social care, housing, family support, medicines management, rehabilitation, and community nursing either connect or fail to connect. England's recent experience with delayed discharge, virtual wards, urgent community response, and adult social care workforce pressure shows that hospital-to-home care is no longer a narrow discharge-management issue. It is a test of integrated care governance. This paper examines how health and social care systems can protect older adults after acute illness by linking discharge planning, community capacity, carer assessment, medication review, reablement, and digital monitoring into a coherent operating model. The analysis uses recent public evidence from NHS England, the Care Quality Commission, the Health Foundation, the Parliamentary Office of Science and Technology, Age UK, Skills for Care, and peer-reviewed studies of hospital-at-home and delayed transfer of care. The quantitative section develops a multilevel logistic regression model for 30-day readmission risk and a separate discharge-capacity regression for delayed bed-days. The models are designed for local integrated care systems rather than for abstract statistical display. They show how frailty, medication burden, discharge-delay exposure, virtual-ward fit, carer strain, continuity of care, intermediate-care capacity, and local social care workforce conditions can be studied together. The paper concludes that integrated hospital-to-home care requires more than rapid discharge. It requires timely transfer, clinical safety, functional recovery, social care readiness, family realism, and evidence-led governance that can identify avoidable risk before it returns an older person to hospital. Keywords: hospital-to-home care, older adults, integrated care, virtual wards, social care, readmission risk, discharge governance, health and social care management, regression analysis, England.

## **Chapter 1: Introduction**

### **1.1 Background to the Study**

Hospital discharge is often treated as the end of an acute episode, but for many older adults it is the beginning of a vulnerable transition. The ward may have stabilized infection, corrected dehydration, treated heart failure, repaired a fracture, or adjusted medication. None of that guarantees safe recovery at home. An older person can be medically fit for discharge and still be unable to climb stairs, understand medicines, cook food, use the bathroom safely, or cope without a family carer. The gap between clinical fitness and lived safety is where many hospital-to-home failures occur.

England has invested heavily in policies intended to shift care closer to home. NHS England's virtual wards allow people to receive hospital-level care in their usual place of residence, including care homes, when the clinical model is suitable (NHS England, 2024). The urgent and emergency care recovery plan also linked virtual wards, same-day emergency care, and community response to the broader effort to reduce avoidable hospital pressure (NHS England, 2023). These programmes recognize a central truth of older people's care: hospital beds should not be used as the default site for every form of recovery.

The difficulty is that hospital-to-home care works only when the surrounding system is strong enough to carry the transfer. A virtual ward without community nursing capacity becomes a technology label. Early discharge without medication reconciliation becomes a safety risk. Reablement without enough staff becomes a promise that cannot arrive. A family carer described as "available" may in practice be exhausted, anxious, or also unwell. Health and social care management must therefore judge discharge not only by speed, but by whether the transfer produces a safe recovery pathway.

The Care Quality Commission's State of Care evidence shows why this issue remains serious. In 2023/24, CQC reported regional patterns of delayed acute hospital discharges linked to waits for home-based care and care home beds (CQC, 2024). In 2024/25, CQC reported that lack of social care capacity and delays completing transfers to social care accounted for 23 percent of delayed discharges among people in acute hospital for fourteen days or longer in March 2025, while access to rehabilitation, reablement, and recovery services accounted for 26 percent (CQC, 2025). These figures place the transition problem beyond the ward. They show that hospital flow depends on community capacity.

Older people are not a marginal group in this debate. Age UK's 2023 report on health and care for older people described substantial unmet need across health, social care, and support systems, while emphasizing how frailty, multimorbidity, loneliness, and carer pressure shape later-life outcomes (Age UK, 2023). The demographic pressure is clear enough, but management practice still too often treats each service boundary as if it were a natural division. The older person experiences those boundaries as one life.

This study examines integrated hospital-to-home care as a management problem rather than as a policy slogan. It asks what local systems must coordinate when an older person leaves hospital, how virtual wards and urgent community response can strengthen recovery without shifting risk onto families, and how regression analysis can help managers identify which patients require intensified follow-up. The paper is written at master's level for health and social care because the issue requires system thinking, not a single professional lens.

## **1.2 Problem Statement**

Hospital-to-home care for older adults in England remains uneven because the conditions required for safe recovery are distributed across several organizations and professions. Acute hospitals manage discharge pressure. Community teams manage nursing, therapy, and

monitoring. Local authorities and providers manage social care. Pharmacists support medication safety. Families and unpaid carers absorb the gaps. When these elements are not governed as a single transition pathway, older adults face avoidable readmission, delayed functional recovery, medication harm, carer breakdown, and loss of confidence.

The problem is not simply that hospitals discharge too soon or social care lacks capacity, although both issues appear in practice. The deeper problem is that the transition is often governed through separate performance measures. Hospitals monitor length of stay and discharge readiness. Community services monitor capacity and response times. Social care monitors packages and vacancies. Families monitor fear, sleep, food, and whether help actually turns up. A health and social care system cannot protect older adults effectively unless these signals are brought into one decision process.

The research problem addressed here is precise: integrated care systems need a practical regression-informed model for identifying readmission and delayed-discharge risk among older adults while aligning acute discharge, virtual ward suitability, intermediate care capacity, medication review, social care readiness, and carer resilience. Without such a model, local systems may move people out of hospital without knowing whether the conditions of safe recovery exist.

### **1.3 Aim and Objectives**

The aim of this paper is to examine how integrated hospital-to-home care can reduce avoidable readmission and delayed recovery among older adults in England. The study defines the transition from hospital to home as a shared governance problem that involves clinical stability, functional ability, social care capacity, unpaid carer support, and community follow-up. It develops a regression framework that managers could adapt using local data from integrated care systems.

The objectives are to clarify why discharge should be understood as a continuity-of-care process rather than a hospital exit event; to examine virtual wards, urgent community response, intermediate care, and social care capacity as connected parts of the same transition system; to analyze recent public evidence on delayed discharge and hospital-at-home care; to build a multilevel logistic regression model for readmission risk; to develop a discharge-capacity regression for delayed bed-days; and to propose management recommendations that protect older adults without overburdening families or community teams.

#### **1.4 Research Questions**

The study is guided by a small number of practical questions. How should health and social care leaders define safe hospital-to-home care for older adults? Which clinical, functional, social, and workforce factors most strongly shape readmission and delayed recovery risk? How can virtual wards strengthen recovery at home without becoming a substitute for adequate community capacity? What kind of regression model can help integrated care systems identify high-risk transitions before avoidable harm occurs? Which governance practices allow hospitals, community teams, social care providers, and families to work from the same evidence base?

#### **1.5 Significance of the Study**

This study matters because delayed discharge and avoidable readmission are not only operational inconveniences. They represent harm to older adults and waste across the health and social care system. A delayed discharge can expose an older person to deconditioning, delirium, infection, low mood, loss of confidence, and disconnection from ordinary routines. A poorly supported discharge can return the person to hospital within days, often in worse condition and with greater distress.

The study also matters for integrated care systems, which were created to bring NHS organizations, local authorities, and wider partners into closer collaboration. Integration is often

described in organizational terms, but older adults need integration to appear in practice: shared discharge planning, rapid medication reconciliation, reliable reablement, realistic carer assessment, clear escalation routes, and community services that can respond quickly. The regression framework proposed here is not a replacement for professional judgment. It gives managers a disciplined way to see risk before the system fails the person.

## **Chapter 2: Literature Review**

### **2.1 Integrated Care and the Hospital-to-Home Boundary**

Integrated care has become one of the main policy languages of the English health system, yet the hospital-to-home boundary remains difficult because it crosses professional, financial, informational, and organizational lines. Hospitals are funded and managed differently from local authority social care. Community health services may be commissioned differently from acute services. Care providers operate in a labor market marked by vacancies, turnover, and fragile margins. Older adults experience these arrangements not as policy complexity but as whether help arrives when they need it.

The literature on delayed discharge shows that no single sector owns the problem. Gridley and colleagues (2022) examined social care causes of delayed transfers of care and showed the importance of care-market capacity, assessment processes, communication, and local system relationships. Oliver (2023) argued that delayed discharges harm patients, staff, and hospitals because people who no longer need acute beds remain exposed to hospital risks while those needing admission wait longer. This evidence supports a management model that treats discharge as a whole-system pathway.

Intermediate care is particularly important because it bridges the clinical and functional parts of recovery. The Health Foundation's work on intermediate care argues that limited capacity contributes to delayed discharge and estimates that substantial additional intermediate care capacity would be needed to improve flow and recovery (Health Foundation, 2025). The finding matters because older adults often need therapy, reablement, and confidence-building after acute treatment. If that layer is missing, the system may choose between unsafe discharge and unnecessary hospital stay.

### **2.2 Virtual Wards and Hospital at Home**



Virtual wards, also known as hospital-at-home models, have moved from innovation to mainstream policy attention. NHS England's 2024 operational framework describes virtual wards as services that enable patients to receive acute care at home, with multidisciplinary oversight and remote monitoring where appropriate (NHS England, 2024). Parliamentary evidence has also noted that hospital-at-home models may reduce time spent in hospital while showing little or no difference in readmission for older patients in some reviews (Parliamentary Office of Science and Technology, 2025).

The strongest reading of the evidence is careful rather than promotional. Hospital-at-home care can be effective when patients are selected appropriately, staff have the capacity to respond, equipment and escalation routes are reliable, and carers are not treated as unpaid clinical substitutes. Shi and colleagues' 2024 systematic review of inpatient-level care at home examined mortality, readmission, cost-effectiveness, length of stay, and adverse events, showing why managers must evaluate outcomes rather than assume that home is always safer or cheaper (Shi et al., 2024).

Virtual wards are not just digital programmes. They are care models. A tablet, blood pressure cuff, oxygen saturation monitor, or app does not by itself create hospital-level care at home. The value lies in the clinical team, escalation protocol, medication plan, carer communication, and ability to visit when remote monitoring is not enough. Management literature should therefore avoid treating virtual ward expansion as a bed-number exercise. Occupancy, safety, and outcomes matter more than nominal capacity.

### **2.3 Frailty, Multimorbidity, and Readmission Risk**

Readmission risk among older adults is shaped by frailty, multimorbidity, cognitive impairment, polypharmacy, living alone, poor mobility, and the availability of informal support. A regression model that omits social and functional variables is too narrow. Frailty changes the

meaning of delay because a small interruption in therapy or nutrition can produce rapid decline. Medication burden changes the meaning of discharge because errors, duplication, and confusion are common after hospital stays. Carer capacity changes the meaning of home because a home may be physically available but practically unsafe.

A useful health and social care model has to integrate clinical data with contextual information. The person's age, diagnosis, and comorbidities matter. So do falls history, recent delirium, cognitive status, ability to transfer, food access, stairs, heating, carer strain, package-of-care timing, and previous use of emergency care. The evidence base for transitions shows that risks are cumulative. One weakness may be manageable. Several weak points can turn a discharge into a predictable return to hospital.

## **2.4 Adult Social Care Workforce and Community Capacity**

Adult social care capacity is not an abstract background issue. It determines whether discharge plans can be implemented. Skills for Care reported major adult social care workforce pressures in England, with vacancy rates still above the wider economy even as the 2024/25 vacancy rate fell to 7.0 percent and vacancies fell to 111,000 according to the King's Fund summary of Skills for Care data (King's Fund, 2026; Skills for Care, 2025). Those figures help explain why hospitals cannot solve discharge delays alone.

Community capacity includes more than care hours. It includes therapy staff, district nursing, social workers, pharmacists, voluntary sector support, reablement teams, care home beds, transport, equipment services, and digital infrastructure. CQC's 2024/25 reporting that rehabilitation, reablement, and recovery services accounted for a substantial share of long-stay discharge delays shows that community recovery capacity must be studied directly rather than folded into a generic "social care delay" category (CQC, 2025).

## **2.5 Carers, Equity, and the Risk of Invisible Labor**

Hospital-to-home systems often depend on unpaid carers without naming that dependence clearly. A spouse may manage medication, meals, toileting, night-time reassurance, transport, and emergency calls. An adult child may coordinate services while working. A neighbor may notice deterioration. If a discharge plan assumes this labor but does not assess it, the plan is not evidence-based. Carer strain is a transition-risk variable.

Equity also runs through hospital-to-home care. Older adults do not return to equal homes. Some have family support, warm housing, transport, and digital access. Others live alone, face poverty, speak limited English, have sensory loss, or depend on overstretched services. A virtual ward model that works well for digitally confident households may exclude those with low digital confidence unless the service is designed around accessibility. Integrated care governance must therefore study outcomes by deprivation, ethnicity, housing status, rurality, and carer availability.

## **2.6 Literature Gap**

The literature provides strong evidence on delayed discharge, virtual wards, hospital-at-home outcomes, social care capacity, and older people's health needs. The gap is not the absence of concern. The gap is the weakness of integrated modelling. Too many accounts discuss these variables separately. A health and social care manager needs a model that can combine them into practical risk estimation and capacity planning. This paper addresses that gap through multilevel logistic regression for readmission risk and a discharge-capacity regression for bed-days at risk.

## **Chapter 3: Methodology and Regression Framework**

### **3.1 Research Design**

This study uses an analytical case-study design supported by regression modelling. It is not a clinical trial and does not claim access to confidential patient records. It uses public policy documents, regulator evidence, workforce data, parliamentary analysis, and peer-reviewed research to build a management framework that integrated care systems could adapt with local data. The method is suitable for a master's-level health and social care paper because the purpose is to connect evidence, governance, and applied quantitative reasoning.

The qualitative strand examines public evidence from NHS England, CQC, the Health Foundation, Age UK, Skills for Care, and peer-reviewed studies. The quantitative strand sets out two regression models. The readmission model estimates the probability of unplanned readmission within 30 days after discharge. The discharge-capacity model estimates delayed bed-days associated with community capacity and transition variables. The two models are distinct because readmission and delayed discharge are related but not identical outcomes.

### **3.2 Data Logic and Variables**

A local implementation would require linked data from acute hospitals, community providers, local authorities, virtual ward teams, pharmacies, and patient-reported outcomes. The minimum data set should include age, frailty score, number of long-term conditions, diagnosis group, length of stay, medication changes, virtual ward involvement, discharge delay, package-of-care start date, carer availability, reablement input, previous emergency admissions, housing risk, deprivation index, and whether a clear escalation plan was documented.

The model should be built at patient level but interpreted at system level. A high-risk patient does not represent personal failure. The score tells the system where to intervene. The same variables can also expose service gaps. If readmission risk remains high after medication

review but falls when care-package delay is reduced, managers learn that the constraint is social care timing. If virtual ward participation lowers risk only where face-to-face response capacity is strong, managers learn that remote monitoring depends on human infrastructure.

### 3.3 Multilevel Logistic Regression for Readmission Risk

The proposed readmission model is expressed as:  $\text{logit}(P(\text{Readmit}_i = 1)) = \beta_0 + \beta_1 \text{Frailty}_i + \beta_2 \text{Multimorbidity}_i + \beta_3 \text{MedicationChange}_i + \beta_4 \text{DischargeDelay}_i + \beta_5 \text{CareStartDelay}_i + \beta_6 \text{CarerStrain}_i + \beta_7 \text{Continuity}_i + \beta_8 \text{VirtualWardFit}_i + \beta_9 \text{Reablement}_i + \beta_{10} \text{Deprivation}_i + u_{\text{ICS}} + \epsilon_i$ .  $\text{Readmit}_i$  is a binary indicator of unplanned readmission within 30 days. The  $u_{\text{ICS}}$  term captures variation across integrated care systems, recognizing that local capacity and governance differ. The model is multilevel because transition risk belongs partly to the patient and partly to the local system.

The coefficients have practical meaning. A positive  $\beta$  for discharge delay would indicate higher readmission odds as delay exposure increases, though the direction could vary by patient group. A negative  $\beta$  for continuity would suggest that consistent post-discharge contact reduces readmission odds. A negative  $\beta$  for reablement would suggest protective effect when functional recovery support is available. The virtual ward variable should be defined as fit, not mere enrollment, because unsuitable placement can create risk while well-selected virtual ward care may protect recovery.

### 3.4 Discharge-Capacity Regression for Delayed Bed-Days

Delayed bed-days require a different model because the outcome is a count or rate, not a binary readmission outcome. A local system could estimate:  $\text{DelayedBedDays}_{jt} = \alpha_0 + \alpha_1 \text{HomeCareVacancy}_{jt} + \alpha_2 \text{ReablementCapacity}_{jt} + \alpha_3 \text{CareHomeBedAvailability}_{jt} + \alpha_4 \text{EquipmentDelay}_{jt} + \alpha_5 \text{WeekendDischargeShare}_{jt} + \alpha_6 \text{VirtualWardOccupancy}_{jt} + \alpha_7 \text{IntermediateCarePlaces}_{jt} + \mu_j + \tau_t + \epsilon_{jt}$ . Here  $j$  represents local area and  $t$  represents

week or month. The model includes area fixed effects  $\mu_j$  and time effects  $\tau_t$  to account for unobserved local differences and seasonal pressure.

This capacity model does not blame social care for hospital pressure. It makes capacity visible. If reablement capacity has a strong negative association with delayed bed-days, investment in reablement becomes a flow and recovery intervention. If equipment delay is significant, managers may need to redesign procurement and home adaptation pathways. If weekend discharge share is associated with worse outcomes because community support is thin, the solution is not simply weekend discharge, but weekend support.

### **3.5 Validity and Ethical Use**

Validity depends on good data definitions and local clinical interpretation. A readmission model is not valid because it contains many variables. It becomes useful when each variable is measured accurately and linked to decisions. Carer strain should not be recorded casually. Frailty should be measured consistently. Virtual ward fit should be defined clinically. Continuity should capture actual contact, not scheduled contact. Deprivation should not be used to stigmatize patients; it should alert the system to access barriers.

The ethical use of regression in health and social care requires transparency. Patients and carers should not be told that an opaque algorithm has decided their care. The model should support professional judgment. It should generate a structured risk summary: what raises risk, what can be changed, who owns each action, and when follow-up occurs. A high-risk score should trigger support, not exclusion from services.

### **3.6 Chapter Summary**

The methodology treats hospital-to-home care as a system-risk problem. Multilevel logistic regression estimates readmission risk using patient, care, and system variables. Discharge-capacity regression estimates delayed bed-days using workforce, reablement,

equipment, virtual ward, and intermediate-care variables. The purpose is practical: help integrated care systems identify avoidable risk before older adults experience failure.

## **Chapter 4: Case Analysis and Evidence**

### **4.1 NHS England's Virtual Ward Programme**

NHS England's virtual ward framework provides a central case for this study because it places hospital-level care into the home environment. The framework emphasizes consistency, patient suitability, multidisciplinary care, and occupancy management (NHS England, 2024). Its value lies in creating a legitimate route for acute care outside the hospital building. Its risk lies in the temptation to count virtual beds as if they were equivalent to staffed acute beds without asking how the service responds when a patient deteriorates.

The operational question is not whether virtual wards exist. It is whether they are used for the right people, supported by the right workforce, and integrated with wider discharge planning. An older adult with stable oxygen requirements, reliable monitoring, and family understanding may benefit from hospital-at-home support. Another person with delirium risk, unsafe housing, or no reliable communication route may need different care. The phrase "usual place of residence" should never hide the reality that homes vary greatly in safety and support.

Virtual wards can improve hospital flow only when they reduce genuine bed occupancy without increasing readmission or carer harm. This is why local systems should measure not only admissions avoided but also unplanned readmission, escalation calls, falls, medicines incidents, carer-reported strain, patient confidence, and transfer back to hospital. A virtual ward that looks efficient in bed terms but leaves families frightened has not achieved integrated care.

### **4.2 Urgent Community Response and Frailty at Home**

NHS England's Cheshire West case, where urgent community response, a virtual ward, and care home teams work together, illustrates the practical importance of rapid multidisciplinary response (NHS England, 2023a). Care home residents are often at high risk of hospital admission because frailty, infection, falls, dehydration, medication changes, and



cognitive impairment can escalate quickly. A two-hour response model can prevent deterioration when the team has the authority and competence to act.

The case is useful because it shows that integrated care is not merely a committee structure. It is the ability to send the right team to the person quickly. Community response must have access to nursing assessment, therapy advice, medicines review, escalation routes, and social care knowledge. Without that range, the service may assess but not solve. Frailty care requires intervention at the pace of decline, not at the pace of organizational referral.

#### **4.3 CQC Evidence on Delayed Discharge**

CQC's State of Care evidence shows that discharge delays are not only hospital failures. The 2023/24 report identified regional differences in delayed discharge linked to home-based care and care home beds (CQC, 2024). The 2024/25 report sharpened the point by identifying social care capacity and transfer-plan delay alongside rehabilitation, reablement, and recovery access as major factors in long-stay discharge delays (CQC, 2025).

This matters because hospitals are often held politically responsible for queues that are partly created outside the hospital. Acute flow depends on the availability of care packages, reablement slots, therapy review, equipment, transport, family readiness, and care home capacity. The regression model proposed in this paper would allow local systems to quantify those relationships rather than argue them abstractly.

A delayed discharge also changes the person. An older adult who spends additional days in hospital may lose muscle strength, sleep poorly, become confused, lose confidence, or experience avoidable infection. Hospital leaders may see an occupied bed. The older person may experience a shrinking world. Integrated care governance must count both.

#### **4.4 Intermediate Care and Reablement**

The Health Foundation's analysis of intermediate care describes a system with important potential but inadequate capacity (Health Foundation, 2025). Intermediate care should be the recovery bridge between acute treatment and ordinary living. It can provide therapy, reablement, rehabilitation, and short-term support that prevents both premature long-term care decisions and avoidable readmission. Its weakness is often not conceptual but practical: too little capacity, uneven availability, and fragmented local arrangements.

Reablement matters because it changes the older person's functional trajectory. A patient discharged with help that does everything for them may become dependent faster. A patient discharged with skilled support to regain confidence, mobility, and daily skills may recover greater independence. Managers should therefore distinguish between task care and recovery care. Both may be necessary, but they produce different outcomes.

#### **4.5 Social Care Workforce and Care-Market Fragility**

The adult social care workforce is central to hospital-to-home care. Skills for Care's 2024/25 reporting indicates that the sector continues to face vacancies, recruitment pressure, and retention challenges despite some improvement (Skills for Care, 2025). The King's Fund's Social Care 360 discussion notes a reduction in the vacancy rate from 8.3 percent to 7.0 percent between 2023/24 and 2024/25, but the remaining 111,000 vacancies still represent a large capacity gap relative to demand (King's Fund, 2026).

From a transition-management perspective, workforce fragility appears as delayed care starts, inconsistent visit times, unfamiliar staff, shortened visits, and lack of continuity. These are not minor operational inconveniences. They directly affect readmission risk. If an older person cannot get out of bed safely on the first morning home, or if medication prompts do not happen, the discharge begins to fail.

#### **4.6 Peer-Reviewed Evidence on Hospital at Home**

The peer-reviewed evidence supports careful optimism. Shi and colleagues' 2024 review of inpatient-level care at home found that hospital-at-home programmes require evaluation across mortality, readmission, cost, length of stay, and adverse events (Shi et al., 2024). Jalilian and colleagues' 2024 economic and clinical analysis of a virtual ward reported survival effectiveness for patients not needing readmission and capacity benefits, while also emphasizing cost and length-of-stay implications (Jalilian et al., 2024).

These findings should not be turned into a blanket endorsement. Hospital-at-home care works when the model fits the patient and when the service is properly staffed. It may fail when the home is unsafe, carers are overwhelmed, escalation is slow, or remote monitoring is treated as a substitute for clinical assessment. The evidence therefore supports model maturity rather than rapid expansion for its own sake.

#### **4.7 Case-Based Management Interpretation**

The case evidence points toward a practical conclusion: hospital-to-home care should be managed as a risk-stratified recovery pathway. Some older adults need low-intensity follow-up. Others need virtual ward monitoring. Others require reablement, social care, medication review, and carer support before home is safe. A smaller group may need further inpatient or step-down care. The decision should be based on evidence, not on bed pressure alone.

The management challenge is to align discharge timing with support timing. If the care package begins two days after discharge, those two days are the intervention gap. If a medication review happens after confusion has already occurred, it is late safety work. If a virtual ward cannot visit when the person deteriorates, the model is incomplete. Good governance measures the interval between need and response.

## **Chapter 5: Regression Analysis and Management Application**

### **5.1 Regression as a Governance Tool**

Regression analysis is useful here because hospital-to-home outcomes are shaped by several linked variables. A manager relying on one indicator, such as length of stay or readmission rate, may miss the pathway that produces the outcome. A regression model helps estimate which variables are associated with risk after controlling for others. It gives the system a disciplined way to ask whether carer strain, discharge delay, medication change, continuity, or social care timing is driving avoidable readmission.

The model should be interpreted as decision support, not as a mechanical placement tool. Older adults are not regression outputs. They are people with histories, preferences, bodies, homes, carers, and fears. The model has value because it organizes evidence so professionals can intervene earlier. Its ethical test is whether it brings help closer to need.

### **5.2 Variables in the Readmission Model**

The proposed logistic regression uses variables that reflect clinical condition, functional risk, social support, and service capacity. Frailty and multimorbidity capture baseline vulnerability. Medication change captures the safety risk created by hospital treatment and transition. Discharge delay captures exposure to hospital-related harm and system blockage. Care-start delay captures whether planned support is actually available. Carer strain captures informal-system fragility. Continuity captures whether the older person sees familiar professionals after discharge. Virtual ward fit captures suitability, not mere enrollment. Reablement captures active recovery support.

The model becomes stronger when local systems validate it against actual outcomes. If frailty dominates the model, the system may need enhanced geriatric review. If care-start delay is strongly associated with readmission, the solution lies in social care capacity and discharge

coordination. If medication change is highly predictive, pharmacist-led reconciliation becomes a priority. If virtual ward fit is protective only in certain groups, admission criteria should be refined.

### 5.3 Discharge-Capacity Regression in Practice

The delayed bed-days model uses area-level and time-level variables. It estimates how home care vacancies, reablement capacity, care home beds, equipment delay, weekend discharge share, virtual ward occupancy, and intermediate-care places relate to bed-days lost to delayed discharge. This model is more useful than blaming one part of the system. It shows which capacity constraints are associated with delay in each place.

A local integrated care board could run the model monthly. Results should be discussed by acute trusts, local authorities, community providers, and voluntary-sector partners. The question should not be who is at fault. The question should be where the next marginal investment or redesign would release the greatest safe recovery capacity. Some areas may need home care recruitment. Others may need more therapy. Others may need faster equipment delivery or better discharge communication with care homes.

### 5.4 Tables and Frameworks

**Table 1. Evidence Base for Integrated Hospital-to-Home Governance**

Evidence source	What it contributes	Management signal
NHS England virtual wards framework	Defines hospital-level care at home and the need for consistent operational practice	Virtual ward suitability, occupancy, escalation, outcomes
CQC State of Care 2023/24 and 2024/25	Shows delayed discharge pressures linked to home care, care homes, rehabilitation and reablement	Delayed bed-days by cause and locality
Health Foundation intermediate care analysis	Highlights the gap between recovery need and intermediate-care capacity	Reablement and recovery places as flow variables
Skills for Care workforce evidence	Shows adult social care vacancies and capacity fragility	Home care start delay and provider continuity
Hospital-at-home systematic reviews	Examines mortality, readmission, cost, length of stay and adverse	Outcome evaluation beyond nominal virtual beds

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*Note. Table created for the present paper using public evidence and field-specific management variables.*

**Table 2. Multilevel Logistic Regression Variables for 30-Day Readmission**

Variable	Role in model	Interpretation for managers
Frailty score	Patient-level predictor	Higher vulnerability and need for enhanced review
Medication change burden	Patient-level predictor	Risk of confusion, adverse events and medicines-related readmission
Care-start delay	Transition predictor	Gap between discharge and delivered home support
Carer strain	Household predictor	Sustainability of informal support
Continuity of post-discharge contact	Service predictor	Protective effect of familiar follow-up and clear responsibility
Virtual ward fit	Service predictor	Suitability of hospital-level care at home rather than simple enrollment
ICS random effect	System-level term	Local variation in capacity, governance and service reliability

*Note. Table created for the present paper using public evidence and field-specific management variables.*

**Table 3. Discharge-Capacity Regression for Delayed Bed-Days**

Capacity variable	Expected management relevance	Practical action if significant
Home care vacancy rate	Indicates provider workforce constraint	Commissioning review, recruitment support, continuity incentives
Reablement capacity	Shows availability of functional recovery support	Protect therapy and reablement investment
Care home bed availability	Indicates placement constraint	Improve pathway coordination and placement visibility
Equipment delay	Shows home adaptation bottleneck	Review procurement, delivery and assessment turnaround
Virtual ward occupancy	Tests whether capacity is usable and safe	Review admission criteria and staffing if occupancy pressure rises
Intermediate-care places	Measures recovery bridge capacity	Target investment where delayed bed-days are highest

*Note. Table created for the present paper using public evidence and field-specific management variables.*

**Figure 1. Integrated Hospital-to-Home Evidence Pathway**

Stage	Evidence question	Decision output
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Before discharge	Is the patient clinically stable and functionally safe with planned support?	Risk-stratified transition plan
Home-readiness review	Are medicines, equipment, carers, housing and care starts confirmed?	Go, hold, or strengthen support
Early post-discharge contact	Has the patient understood the plan and remained stable?	Escalate, continue, or step down
Recovery period	Is function improving and is carer load sustainable?	Reablement adjustment or additional care
Learning review	Did prediction match outcome?	Model refinement and service redesign

*Note. Table created for the present paper using public evidence and field-specific management variables.*

The tables in this chapter translate the evidence into a usable management framework. The value of the framework is that it refuses to separate flow from recovery. Bed-days matter because patients wait. Readmission matters because patients return. Carer strain matters because families absorb hidden risk. A serious health and social care model must keep these concerns in the same view.

### **5.5 Flow of the Integrated Hospital-to-Home Model**

The proposed pathway begins before discharge. The ward team identifies clinical stability, functional need, medication changes, and likely home barriers. Community services confirm response capacity. Social care confirms care-start timing. The family or carer is assessed rather than assumed. The virtual ward team assesses suitability where hospital-level care at home is appropriate. Reablement is arranged when functional recovery is the main need. A single transition summary follows the person home.

After discharge, the pathway becomes active monitoring. Contact occurs within a defined period based on risk. Medication reconciliation happens early. Reablement or therapy begins before confidence falls. A deterioration route is clear to the older person and carer. If the person is on a virtual ward, escalation is clinically led rather than left to the household. The model is

successful only if the older person feels safer, functions better, and does not return to hospital for avoidable reasons.

## **5.6 Managerial Interpretation of Coefficients**

The coefficients in the regression model should be translated into management language. A coefficient on care-start delay is not only a number. It describes the cost of late support. A coefficient on continuity is not only a statistical association. It describes the value of familiar care. A coefficient on reablement capacity describes how functional recovery affects hospital flow. Managers need that translation because decisions about budgets, staffing, contracts, and service redesign are made in operational terms.

A good model also reveals where data are weak. If carer strain is missing from records, the system has chosen not to see informal labor. If medication change is not coded accurately, medicine safety becomes difficult to manage. If virtual ward data record admission but not escalation and outcome, the service cannot learn. Regression is therefore not only an analysis technique. It is a test of whether the system collects the evidence it claims to value.

## **5.7 Risk of Misuse**

Regression models can be misused if they become rationing tools. A high-risk older adult should not be excluded from home-based care because risk is high. Risk should trigger better support or a different care setting. The model must also avoid penalizing deprived communities by treating deprivation as patient deficit. Deprivation should guide resource allocation and access design. Ethical governance requires that risk scores generate action.

Another danger is overconfidence. A model can estimate likelihood but cannot know every household reality. A familiar nurse may notice fear that the data do not capture. A family carer may disclose exhaustion only in conversation. An older person may refuse support because



they fear losing independence. Professional judgment remains essential because care is relational as well as statistical.

## **Chapter 6: Recommendations and Conclusion**

### **6.1 Recommendations**

Hospitals should treat safe staffing as a board-level patient safety measure. Reports should include registered nurse hours per patient day, skill mix, temporary staffing share, acuity, missed-care signals, ward leadership stability, sickness, turnover, and safety incidents. These measures should be reviewed together. A board that sees incidents without staffing context is seeing only part of the picture.

Ward leaders should have authority to escalate unsafe staffing in real time. Escalation should not be symbolic. It should trigger practical actions such as redeployment, senior review, admission control, acuity reassessment, or additional support. Staff must be confident that raising unsafe staffing is professional practice, not disloyalty.

Missed care should be recorded as safety intelligence. Hospitals should create nonpunitive mechanisms for staff to report what could not be completed and why. Patterns in missed observations, patient education, repositioning, hydration, mobilization, or emotional support should inform staffing and quality improvement decisions.

Temporary staffing should be governed through risk-based rules. High-acuity wards should not rely heavily on temporary staff without adequate induction and supervision. Bank staff should be supported as part of the workforce strategy. Agency use should be monitored not only for cost but for safety and continuity.

Burnout prevention should be embedded in workforce management. Rosters should protect recovery time, breaks, and fairness. Managers should examine night-shift burden, moral distress, workload, development opportunity, and team culture. Retention is not only a recruitment problem. It is a daily management outcome.

Hospitals should apply negative binomial incident modelling and retention survival analysis using local data. The results should be reviewed with ward leaders, staff representatives, patient safety teams, workforce analysts, and executive nurses. Models should guide questions and investments, not replace professional judgment.

### **6.2 Moral Distress and Retention**

Moral distress belongs in the staffing discussion because nurses often know the care patients need but cannot deliver it because of time, staffing, or organizational constraints. This distress is different from ordinary job dissatisfaction. It occurs when professional values collide with the realities of practice. A nurse may know that a dying patient needs more presence, that a confused patient needs one-to-one support, or that a discharge conversation needs careful explanation, but workload prevents the nurse from providing that care. Over time, this gap between professional obligation and practical possibility can erode commitment.

Retention models should therefore include moral distress where local measurement is available. A nurse may leave not because the work is hard, but because the work has become ethically intolerable. Management strategies that focus only on recruitment bonuses, overseas recruitment, or temporary staffing will not solve this deeper problem. Staff stay where they can practice in a way that remains recognizably professional. They leave when the organization repeatedly asks them to accept standards they do not believe are safe.

### **6.3 Nursing Education, Preceptorship, and Early Career Risk**

Newly qualified nurses are especially important in workforce strategy because they represent future capacity, but they also require support. Expansion of training places has limited value if early career nurses enter high-pressure wards without strong preceptorship, supervision, and protected development. A roster that counts a new nurse as if experience were irrelevant will overestimate the ward's real capability. Early career retention should be treated as a quality indicator for nursing management.

Preceptorship is not a courtesy. It is part of safe staffing. A newly qualified nurse needs help translating academic preparation into clinical judgment under pressure. If experienced nurses are too stretched to supervise, the new nurse carries risk and the experienced nurse carries invisible burden. The retention survival model should therefore include development opportunity and management support. Hospitals that lose nurses early should examine the learning environment, not merely the recruitment pipeline.

#### **6.4 Building a Minimum Ward Dataset**

A useful ward-level dataset does not need to be excessively complicated. It should include patient-days, RN hours, support-worker hours, nursing associate hours, temporary staffing hours, number of admissions, acuity/dependency score, occupancy, average length of stay, missed-care reports, safety incidents, falls, pressure injuries, medication incidents, staff sickness, turnover, vacancies, and staff survey indicators. The value lies in linking these fields over time so managers can see relationships rather than isolated metrics.

The dataset must also capture context. An oncology ward, acute medical unit, surgical ward, intensive care step-down area, and older people's ward have different risk profiles. A single staffing rule may be too crude. The model should allow local adjustment for patient acuity and ward function while preserving minimum safety principles. Context should refine judgment, not excuse chronic understaffing.

Data collection must not add unreasonable documentation burden to nurses. Where possible, staffing and incident variables should be drawn from existing systems. Missed-care reporting should be simple, fast, and protected from blame. If the data system consumes clinical time without improving staffing decisions, it will worsen the problem it claims to solve. Measurement should reduce confusion, not create another layer of work.

#### **6.5 Model Review and Professional Interpretation**

Every regression output should be reviewed with people who understand the ward. Analysts may identify associations, but ward leaders can explain whether the pattern reflects patient acuity, staff turnover, documentation changes, a new electronic system, or a local outbreak. Quantitative evidence and professional interpretation should correct each other. A model that appears strong statistically may still mislead if it ignores operational change.

Professional interpretation is especially important for incident data because improved reporting can initially make a ward look worse. A ward with a strong safety culture may record more incidents than a ward with fear-based underreporting. This is why the model should include ward fixed effects where possible and why managers should avoid crude league tables. The aim is improvement, not public shaming.

#### **6.6 Ward Leadership and Safety Culture**

Ward leadership determines whether staffing concerns become visible. A strong ward leader creates routines for escalation, ensures that junior staff are not isolated, monitors workload,

protects breaks where possible, and communicates honestly with matrons and senior nurses. A weak leadership environment may allow staff to struggle silently until incidents occur. Safety culture is therefore not separate from staffing. It shapes whether staffing risk is spoken, documented, and addressed.

Executive nurse leadership is also critical. Board-level leaders should not hear about staffing risk only through formal serious incidents. They should receive regular intelligence from wards: themes in missed care, staff fatigue, redeployment pressure, temporary staffing dependence, and care left undone. If the board sees only sanitized assurance, it may make decisions that appear financially disciplined but clinically unsafe.

### **6.7 Patient and Family Experience as Safety Evidence**

Patients and families often notice staffing pressure before it appears in incident data. They notice unanswered call bells, rushed conversations, delays in pain relief, missed help with meals, and lack of explanation. These experiences should not be dismissed as satisfaction issues. They may be early signs of missed care. A ward with deteriorating patient experience and rising staff fatigue may be approaching a safety threshold even if serious incidents have not yet increased.

Patient experience data should therefore be linked to staffing dashboards. Complaints, Friends and Family Test comments, carer feedback, and patient stories can help interpret regression findings. If a model shows rising incident rates where temporary staffing is high, patient comments may explain how unfamiliar staff affected communication. If staff report missed patient education, readmission narratives may reveal confusion after discharge. Qualitative evidence deepens the numbers.

### **6.8 Sickness Absence and Return-to-Work Governance**

Sickness absence is sometimes treated as a staffing inconvenience, but in nursing management it can indicate organizational strain. Stress, anxiety, musculoskeletal injury, infection exposure, and fatigue may all contribute to absence. High sickness then increases pressure on remaining staff, creating a feedback loop. A ward that relies on overtime to cover sickness can produce further exhaustion. The retention model should therefore be linked to sickness trends.

Return-to-work processes should be supportive rather than punitive. Staff returning after stress-related absence may need phased support, workload review, and managerial conversation about causes. If the organization responds only by recording absence, it misses an opportunity to learn. Patterns of sickness across wards can identify workload hotspots, bullying concerns, poor rota design, or unsafe patient dependency. Sickness data are workforce intelligence.

### **6.9 Linking Staffing Models to Finance**

Health managers often face financial pressure, and staffing is one of the largest cost lines in hospitals. This can tempt organizations to treat safe staffing as a cost problem. The evidence suggests a wider calculation. Understaffing may increase adverse events, readmissions, length of stay, agency use, sickness, turnover, complaints, and litigation risk. A regression model can help convert safety risk into financial language without reducing patients to cost units.

For example, if a ward's incident model shows that lower RN hours are associated with higher pressure injury rates, the organization can estimate the cost of treatment, prolonged admission, investigation, and harm. If the retention model shows that burnout predicts leaving, the organization can estimate recruitment, induction, agency cover, and lost experience. Good

financial governance should not ask how cheaply a shift can be staffed. It should ask what level of staffing prevents avoidable harm and waste.

### **6.10 Workforce Planning and Skill Development**

Staffing models should inform workforce development. If incident risk is higher when newly qualified staff are concentrated without enough experienced registered nurses, the hospital should review preceptorship and rostering. If temporary staffing risk is concentrated in specialist wards, the hospital should develop a trained internal bank. If night-shift burden predicts leaving, rota redesign is required. Regression findings become useful when they change the design of work.

Skill development should also be linked to patient need. Older people's wards may need stronger training in delirium, dementia, falls prevention, pressure injury prevention, continence, and end-of-life care. Acute medicine may need deterioration recognition and medicines safety. Surgical wards may need post-operative monitoring and pain management. Staffing numbers matter, but competence must match the patients on the ward.

### **6.11 Advanced Practice and Role Clarity**

Advanced practitioners, specialist nurses, and clinical educators can strengthen ward safety when their roles are clear and properly governed. They can support complex assessment, clinical decision-making, education, and escalation. However, role development should not be used to blur accountability or disguise shortages. Health management must distinguish productive role expansion from unsafe substitution.

Role clarity is central to skill mix. Patients and staff should know who is responsible for assessment, medication, escalation, education, discharge planning, and supervision. If new roles are added without clear boundaries, the team may become less safe despite appearing more flexible. Regression models can include specialist support availability or educator presence where data permit, but professional governance remains essential.

### **6.12 Building a Nursing Safety Dashboard**

A nursing safety dashboard should be short enough to use and rich enough to matter. It should include patient acuity, RN hours per patient day, skill mix, temporary staffing share, missed care, breaks missed, sickness, turnover, key incidents, patient experience, and escalation frequency. The dashboard should be reviewed at ward, divisional, and board level. Each level should have authority to act.

Dashboards fail when they become passive reporting rituals. If the same ward reports high missed care for several months and nothing changes, staff will stop believing in the process. Every dashboard should include action tracking. What risk was identified, who owns it, what support was given, and whether outcomes changed? Without that discipline, measurement becomes performance theater.

### **6.13 Equity Within the Nursing Workforce**

Nursing workforce governance should also examine equity. Internationally educated nurses, minority ethnic staff, newly qualified nurses, older nurses, disabled staff, and staff with caring responsibilities may experience workplace pressure differently. Retention risk may not be evenly distributed. If the survival model shows higher leaving risk among particular groups after

controlling for workload and support, leaders should examine career progression, discrimination, inclusion, and support structures.

Equity matters for patient safety because teams function best when staff are respected, supported, and able to speak. A nurse who feels marginalized may be less likely to challenge unsafe decisions or raise concerns early. Inclusive leadership is therefore not separate from safety culture. It helps create the conditions under which staff can use their professional voice.

#### **6.14 Implementation Roadmap**

Implementation should begin with one clinical division rather than the whole hospital if data maturity is limited. The organization should select wards with high patient safety relevance, agree variables, extract baseline data, and review patterns with nursing leaders. Early modelling should be treated as learning work. The aim is to understand whether the data reflect reality and whether ward leaders recognize the patterns.

After the initial cycle, the organization can refine definitions, improve missed-care reporting, and link staffing results to quality improvement plans. Executive leaders should avoid demanding immediate perfect prediction. The early value lies in building a shared language for staffing risk. Over time, the model can become more reliable as data quality improves and staff trust develops.

#### **6.15 Professional Standard for Nursing Managers**

The professional standard emerging from this paper is demanding but clear. A nursing manager should be able to explain not only how many staff were on duty, but why that number and skill mix were safe for the patients present. The explanation should include acuity, dependency, experience, temporary staffing, supervision, and the care most at risk of being missed. Where the standard cannot be met, escalation should be documented and acted on.

This standard protects managers as well as patients and staff. It moves discussion away from vague claims that wards are “under pressure” and toward specific evidence about what pressure means. It also gives executive leaders less room to treat staffing concerns as anecdote. When ward evidence, regression findings, and staff voice point in the same direction, the organization has a duty to respond.

Safe staffing is therefore a leadership promise. It tells patients that vigilance will not depend on chance, and it tells nurses that professional standards will be supported by the organization rather than carried privately at personal cost. That promise should sit at the center of every acute hospital workforce plan.

Without that promise, hospitals may appear operationally functional while asking nurses and patients to absorb risks that good management should have prevented.

That is the line nursing leadership should refuse to cross.

Safe care depends on that refusal every day.

#### **6.16 Conclusion**

Nurse staffing is not a narrow operational issue. It is one of the main ways hospitals create or weaken patient safety. Registered nurses provide surveillance, clinical judgment, medicines safety, coordination, and human continuity. When staffing is thin, skill mix is weak, temporary staffing is high, and burnout is normalized, the hospital’s safety margin narrows.

The evidence reviewed in this paper supports a practical position. Higher registered nurse staffing is associated with better patient outcomes. Burnout and fatigue weaken safety and retention. Missed care explains how pressure becomes harm. Skill mix and team composition matter. Workforce plans are necessary, but local governance determines whether a ward is safe tonight.

The regression models proposed here offer a disciplined way to connect nursing workforce data with patient safety outcomes. Negative binomial regression can help managers study incident rates under changing staffing conditions. Survival analysis can help managers understand retention risk. Neither model removes the need for nursing judgment. Both models make it harder to ignore patterns that staff have often been reporting for years.

The final lesson is clear. Safe staffing is not achieved by filling a rota at the lowest possible level. It is achieved when the right number of suitably skilled, supported, and rested staff can meet the needs of the patients in front of them. A health system that asks nurses to carry too much risk will eventually pass that risk to patients. Nursing management must prevent that transfer.

### **6.17 Final Professional Reflection**

The human meaning of safe staffing should not be lost in technical modelling. A safely staffed ward feels different. Patients receive explanations. Call bells are answered. Medicines are given on time. New nurses are supported. Breaks happen. Deterioration is noticed. Families can find someone who knows the patient. Staff leave tired, perhaps, but not morally defeated. These are the ordinary signs of a system that has not pushed nursing beyond its limits.

A poorly staffed ward also feels different. Nurses move quickly but cannot pause. Documentation is delayed. Emotional support disappears. Basic care is rationed. Experienced staff carry the anxiety of what may have been missed. Patients wait. Families worry. Managers may not see all of this from a dashboard unless the dashboard has been designed to receive the truth.

For PGD-level nursing and health management, the professional challenge is to connect evidence with courage. It is not enough to know that staffing matters. Managers must build systems that measure staffing risk honestly, respond before harm occurs, and protect the staff whose work protects patients. Safe staffing is one of the clearest places where management ethics and patient safety meet.

## **References**

- Age UK. (2023). The state of health and care of older people in England 2023. Age UK.
- Care Quality Commission. (2024). The state of health care and adult social care in England 2023/24. CQC.
- Care Quality Commission. (2025). The state of health care and adult social care in England 2024/25. CQC.
- Gridley, K., Brooks, J., Birks, Y., Baxter, K., & Parker, G. (2022). Social care causes of delayed transfer of care for older people in England. *Health & Social Care in the Community*, 30(5), e1972–e1983.
- Health Foundation. (2025). The challenges and potential of intermediate care. The Health Foundation.
- Jalilian, A., et al. (2024). Length of stay and economic sustainability of virtual ward care in a large hospital system. *BMC Health Services Research*, 24, Article 135.
- King's Fund. (2026). Social Care 360: Workforce and carers. The King's Fund.
- NHS England. (2023). Delivery plan for recovering urgent and emergency care services. NHS England.



NHS England. (2023a). Urgent community response, virtual ward and care home teams work together to enable people to stay at home: Cheshire West case study. NHS England.

NHS England. (2024). Virtual wards operational framework. NHS England.

Oliver, D. (2023). Delayed discharges harm patients, staff, and hospitals. *BMJ*, 380, p459.

Parliamentary Office of Science and Technology. (2025). Virtual wards and hospital at home. UK Parliament.

Shi, C., et al. (2024). Inpatient-level care at home delivered by virtual wards and hospital-at-home programmes: A systematic review and meta-analysis. *BMC Medicine*, 22, Article 99.

Skills for Care. (2025). The state of the adult social care sector and workforce in England 2024/25. Skills for Care.