



Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number:	TER364
Topic:	Virtual wards
Summary of findings:	<p>Virtual wards, sometimes also called virtual hospital models of care, provide care to people in the community, either in a patient's home or other care setting, when they may otherwise have been admitted to or remained in hospital.</p> <p>Two previous evidence reviews studying the effectiveness of virtual wards found evidence on their use in a range of different target populations (people with specific chronic conditions, or people who are at risk of hospital admission or need enhanced support after hospital discharge). The sources of evidence also varied in terms of the scope of the virtual ward: who was involved in delivering and managing care, and what types of interventions were included. Both reviews reported mixed conclusions on the effectiveness of virtual wards, measuring outcomes such as risk of mortality, admission to hospital or re-admission after discharge. The reviews suggested the evidence of benefit from virtual wards is strongest in people with heart failure or coronary artery disease. Two further individual studies not included in the reviews found that introduction of a virtual ward model resulted in reduced rates of emergency presentation and/or unplanned hospital admission in people at high risk of hospital admission, or those who need enhanced care due to acute illness due to a variety of conditions,</p> <p>Overall, the evidence suggests virtual ward models of care have the potential to offer benefits such as reduction in hospital admission or emergency presentation, but further research is needed to establish who is most likely to benefit from this type of care and what interventions it should include.</p>

Introduction and aims

Virtual wards, sometimes also called virtual hospital models of care, provide care to people in the community either in a patient's home or other care setting, when they would otherwise typically have been admitted to or remained in hospital. It can also involve more intensive and structured monitoring and follow-up in people who have been discharged from hospital, in addition to the usual routine follow-up they would receive. In either scenario, care is planned and managed by a multi-disciplinary team, with some or all elements of care delivered virtually. People for whom this type of care is suitable include those at high risk of hospitalisation because of a pre-existing condition, and people recently discharged from hospital who need continue to need care and/or who are at risk of readmission. The activities involved in this care, and the staff required to deliver care, may vary according to the condition and setting, but can involve developing individualised care plans; engaging the patient and family on treatment and care at home; coordinating care and facilitating communication; providing direct treatment and rehabilitation; monitoring patients' progress and reviewing readiness for discharge from the virtual ward.

Health Technology Wales researchers searched for evidence on virtual wards for use in any community setting. We focussed on evidence where the virtual ward model of care was planned and managed by a multidisciplinary team. For evidence of effectiveness, we focussed on studies that reported rates of preventing hospital admission/re-admission, but also searched for any other potentially relevant outcomes.

Evidence overview

We identified two evidence reviews studying the effectiveness of virtual wards. One studied their use post-hospital discharge (Uminski, 2018). It is unclear if these always included management of care by a multidisciplinary team so not all evidence may be relevant to the review question. A second review studied various 'virtual hospital' models of care (Moore, 2020), and included evidence on a range of interventions including the use of telehealth, with and without remote monitoring, but did not identify any studies that covered the entire of a virtual ward model. Below, we summarise these reviews, and as neither fully matched the research area of interest, we have also summarised individual studies that (i) were identified by our searches in addition to the evidence reviews, or (ii) were included in the reviews and focus on delivery of aspects of care via a multidisciplinary team; (ii) were found by our searches and not included within either review.

Evidence reviews

Uminski (2018) reviewed evidence evaluating the effect of post-discharge virtual wards, as an alternative to usual community based care (typically involving routine follow-up only), on hospital readmissions and mortality. They included randomised trials of post-discharge virtual wards versus community based, usual care, and studied heart failure and non-heart failure populations but reported evidence on them separately. In patients with heart failure, results from six trials found a post-discharge virtual ward reduced risk of mortality (RR 0.59, 95% CI = 0.44–0.78). Heart failure-related readmissions were also reduced (RR 0.61, 95% CI = 0.49–0.76), but there was no statistically significant difference in rates of all-cause readmission between people treated with the virtual ward model compared to usual care. In contrast, in four trials of patients with undifferentiated high-risk chronic diseases, admission to a post-discharge VW did not result in a reduction in mortality or hospital readmissions compared to usual care. The authors concluded that a post-discharge virtual ward model can provide added benefits to usual community based care to reduce all-cause mortality and heart failure-related hospital admissions among patients

with heart failure. Further research is needed to evaluate the utility of VWs in other chronic disease settings.

Moore (2020) conducted a 'rapid evidence scan' guided by the following question: What is known about the effectiveness of virtual hospital models of care? The authors identified 16 reviews and 4 single studies that met the inclusion criteria for the review. No review evaluated a (complete) virtual hospital model of care. Tele-healthcare and remote telemonitoring were delivered using a range of modalities such as telephone, videoconferencing, wearable devices, e-programs, store and forward and computer based and robotic technologies and were delivered with or without face to face care. The majority of the studies examined cardiovascular disease, diabetes, cancer, stroke, respiratory and mental health conditions. Other conditions included speech function, eye disease, ear nose and throat or skin conditions, neurological, and nephrological or urological conditions. Reviews evaluated tele-healthcare (only) or tele-healthcare with remote telemonitoring interventions.

Findings from the evidence were mixed: in some studies interventions reduced hospitalisations, readmissions, emergency department visits and length of stay but in others they made no significant difference compared to usual care. In relation to specific conditions, the authors concluded that the strongest evidence for tele-healthcare and telemonitoring is for cardiac failure patients and those with coronary artery disease, for people with diabetes and for stroke rehabilitation. There is less evidence available for cancer. The evidence for respiratory conditions, such as COPD, is inconclusive.

As noted above, the authors did not find any evidence that covered the entire of a virtual ward model. Furthermore, care did not always involve a multidisciplinary team, and so some of the evidence included in this review may not meet the definition of virtual ward care used in this topic exploration report. Studies below may focus on multidisciplinary care specifically, in other cases, care received was not fully described or was delivered via a single health worker/involved focused interventions rather than a package of care.

- Lunney (2018) systematically reviewed studies that examined the effectiveness of telehealth versus or in addition to usual care for management of end-stage renal disease. Details of ten relevant studies (7 randomized trials and 3 cohort studies) were reported, four described as using a 'team of telehealth workers.' In four other studies nurses delivered telehealth, the remaining two studies are not clearly described. Two studies examined telehealth interventions versus standard ESRD care and demonstrated mixed results on processes of care, no differences in laboratory surrogate markers of ESRD care, and reduced or similar rates of hospitalization. Eight studies evaluated the addition of telehealth to usual care and demonstrated no significant improvements in processes of care or surrogate laboratory measures, variable impacts on hospitalization rates, and mixed impacts on some domains of quality of life, including improvement in mental health
- Jakobsen (2015) conducted a randomised trial comparing home-based telehealth hospitalization to standard treatment and care at the hospital in people with COPD who had suffered an exacerbation. The virtual care included virtual ward rounds, but the mix of healthcare workers involved in planning and delivery of care are unclear. The aim of the trials was to establish whether virtual care was non-inferior to hospitalisation in terms of likelihood of readmission within 30 days of discharge. The authors concluded that patients with severe COPD can be treated for acute exacerbation at home using a virtual model of care, but the results did not prove that virtual care was non-inferior to hospitalisation, and this requires further investigation.

- Dhalla (2014) conducted a randomised trial to determine whether a virtual ward—a model of care that uses some of the systems of a hospital ward to provide interprofessional care for community-dwelling patients—can reduce the risk of readmission in patients at high risk of readmission or death when being discharged from hospital. Virtual care was provided by an inter-professional team (exact skill mix unclear). The primary outcome was a composite of hospital readmission or death within 30 days of discharge. There were no statistically significant between-group differences in this outcome at 30 or 90 days, 6 months, or 1 year.

Individual studies

Lewis (2017) carried out a quantitative observational study in Ireland of a community virtual ward (CVW) model developed to assist health care professionals to support older persons at home during periods of illness and/or functional decline. Unplanned hospital admissions and emergency department (ED) presentations were measured pre- and post-implementation of the virtual ward model of care. Over 12 month period, 54 patients were managed using the virtual ward model of care. There was a reduction in ED presentations post-CVW admission ($P < 0.001$), and median unscheduled admissions were reduced ($P = 0.001$).

Jones (2014) describes the implementation of a virtual ward model in the work of an enhanced care team (who provide rapid response/crisis intervention; or work with people at high risk of hospital or care home admission/who require support after hospital discharge). The study was carried out in England. Study participants were admitted to the virtual ward where they were identified as needing an advanced level of care that might otherwise have resulted in admission to hospital. A multidisciplinary team was involved in management and delivery of their care while admitted to the virtual ward. Following the launch of the service in 2011, activity pre- and post-launch was compared. Overall emergency admission activity reduced by 10%, which equated to a reduction of 637 emergency admissions. It is not clear how many people were included in the pre- and post-intervention period, and the care people received before implementation of the virtual ward model is not fully described.

Areas of uncertainty

As the evidence above makes clear, there is uncertainty around the precise scope and definition of virtual wards, and which people are most likely to derive benefit from them. As many study authors acknowledge, there will, by necessity, be variation in the care people receive as part of a virtual ward, to ensure this is individualised to them, but this also makes findings on their effectiveness difficult to interpret. Furthermore, a full description of the care received in each source of evidence, and where variation exists, is beyond the scope of this report.

Defining a population of particular interest in which to examine the effectiveness of the virtual ward model of care could allow some these uncertainties to be explored in more detail.

Literature search results

Health technology assessments and guidance

No relevant assessments, guidelines or guidance found.

Evidence reviews and economic evaluations

Uminski, K., Komenda, P., Whitlock, R., Ferguson, T., Nadurak, S., Hochheim, L., Tangri, N., & Rigatto, C. (2018). Effect of post-discharge virtual wards on improving outcomes in heart failure and non-heart failure populations: A systematic review and meta-analysis. *PloS one*, 13(4), e0196114. <https://doi.org/10.1371/journal.pone.0196114>

Moore G, Du Toit A, Jameson B, Liu A, Harris M. The effectiveness of 'virtual hospital' models of care: a Rapid Evidence Scan brokered by the Sax Institute (www.saxinstitute.org.au) for Sydney Local Health District, 2020. https://www.saxinstitute.org.au/wp-content/uploads/20.04_Rapid-Evidence-Scan_The-effectiveness-of-virtual-hospitals.pdf

Studies included within that focus on our definition of a virtual ward model (see Evidence Overview for rationale):

- Jakobsen AS, Laursen LC, Rydahl-Hansen S, Østergaard B, Gerds TA, Emme C, Schou L, Phanareth K. Home-based telehealth hospitalization for exacerbation of chronic obstructive pulmonary disease: findings from "the virtual hospital" trial. *Telemed J E Health*. 2015 May;21(5):364-73. <https://doi.org/10.1089/tmj.2014.0098> (Care provided as 'home-based telehealth hospitalisation' including virtual ward rounds. Healthcare workers involved in planning and delivery of care unclear)
- Lunney M, Lee R, Tang K, Wiebe N, Bello AK, Thomas C, Rabi D, Tonelli M, James MT. Impact of Telehealth Interventions on Processes and Quality of Care for Patients With ESRD. *Am J Kidney Dis*. 2018 Oct;72(4):592-600. <https://doi.org/10.1053/j.ajkd.2018.02.353> (Details of ten relevant studies reported, four described as using a 'team of telehealth workers.' In four other studies nurses delivered telehealth, the remaining two studies are not clearly described)
- Dhalla IA, O'Brien T, Morra D, Thorpe KE, Wong BM, Mehta R, Frost DW, Abrams H, Ko F, Van Rooyen P, Bell CM, Gruneir A, Lewis GH, Daub S, Anderson GM, Hawker GA, Rochon PA, Laupacis A. Effect of a postdischarge virtual ward on readmission or death for high-risk patients: a randomized clinical trial. *JAMA*. 2014 Oct 1;312(13):1305-12. <https://doi.org/10.1001/jama.2014.11492> (Care provided by an 'interprofessional team')

Individual studies – restricted to those not included in the evidence reviews above

Jones J, Carroll A. Hospital admission avoidance through the introduction of a virtual ward. *Br J Community Nurs*. 2014 Jul;19(7):330-4. <https://doi.org/10.12968/bjcn.2014.19.7.330>

The ageing British population is placing increased demands on the delivery of care in mainstream health-care institutions. While people are living longer, a significant percentage is also living with one or more long-term conditions. These issues, alongside continuing financial austerity measures, require a radical improvement in the care of patients away from hospitals. The Wyre Forest Clinical Commissioning Group introduced a virtual ward model for two main purposes: to save on spiralling costs of hospital admissions, and, secondly, to ensure the preferred wishes of most patients to be cared for and even die at home were achieved. This commentary describes how the virtual ward model was implemented and the impact of preventing unplanned emergency admissions to hospitals. The setting up of enhanced care services and virtual wards in one county is discussed, aiming to highlight success points and potential pitfalls to avoid. The results from the implementation of the virtual ward model show a significant reduction in emergency and avoidable patient admissions to hospital. The success of virtual wards is dependent on integrated working between different health-care disciplines.

Lewis C, Moore Z, Doyle F, Martin A, Patton D, Nugent LE. A community virtual ward model to support older persons with complex health care and social care needs. *Clin Interv Aging*. 2017 Jun 26;12:985-993. <https://doi.org/10.2147/CIA.S130876>

Background: Globally the older population is increasing rapidly. As a result there is an increase in frail older persons living within the community, with increased risks of a hospital admission and higher mortality and morbidity rates. Due to complexity of care, health care professionals face challenges in providing effective case management and avoiding unplanned admissions to hospital. **A community virtual ward (CVW) model was developed to assist health care professionals to support older persons at home during periods of illness and/or functional decline.** Methods: A quantitative observational study was conducted to examine if a CVW model of care reduced unplanned hospital admissions and emergency department (ED) presentations in **54 patients over a 12-month period.** The sign-rank test examined matched data on bed days, ED presentations,

and unplanned hospital admissions pre- and post-CVW implementation. Other risk factors for admission to hospital were examined using the Mann-Whitney test pre-and post-CVW admission, including falls, living alone, and cognition. Correlations between hospital admission avoidances and unplanned hospital admissions and ED presentations were tested using Spearman's ρ test. Results: There was a **reduction in ED presentations post-CVW admission (P<0.001), and median unscheduled admissions were reduced (P=0.001)**. Those living alone had a lower number of ED presentations (median 0.5, interquartile range 0-1) prior to admission in comparison to those living with a caregiver, with no differences observed during admission to CVW. For those who experienced a fall during CVW admission, the odds ratio (OR) of requiring long-term care doubled for each extra fall (OR =2.24, 95% CI 1.11 to 4.52, P=0.025). Reduced cognition was associated with an increased risk of ED presentations ($\rho=0.292$, P<0.05) but not associated with increased risks of unplanned hospital admissions ($\rho=0.09$, P=0.546). There were no significant correlations seen between admission avoidance and the number of unplanned hospital admissions or ED presentations. Conclusion: Through an integrated approach to care, a CVW model in the care of older persons can reduce ED presentations and unplanned hospital admissions.

Ongoing research

We did not searched for ongoing research due to the volume of existing evidence found.

Date of search:

May 2021

Concepts used:

Virtual wards, hospital at home, telehealth