NICE National Institute for Health and Care Excellence

Evidence generation plan for virtual ward platform technologies for acute respiratory infections

Implementation support

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1 Purpose of this document

NICE's assessment of virtual ward platforms for acute respiratory infections recommends that further evidence is generated while these technologies are being used in the NHS. The use of virtual wards is also considered in the NICE guideline on acute respiratory infection in over 16s.

This evidence generation plan was developed as a bespoke product in NICE's Health Technology Assessment Innovation Laboratory (HTA Lab). The plan was adapted to address specific issues associated with virtual ward platform technologies. This plan outlines the evidence gaps for the technology in acute respiratory infection pathways and what real-world data needs to be collected to address those gaps. It is not a study protocol.

2 Evidence gaps

NICE's guidance identified gaps in the evidence for clinical and cost effectiveness of virtual wards technologies for acute respiratory infections, but the gaps are also relevant to the use of virtual wards in other disease areas. NICE's assessment notes that additional evidence should be collected on the following clinical and cost outcomes:

- **Length of virtual ward or hospital stay:** this is needed to evaluate the effect of virtual wards on reducing hospital stay lengths and to assess associated resource savings.
- **Hospital care escalation and admission rates:** this is needed to evaluate the risk of admission to hospital or emergency care during, or after, care on a virtual ward.
- **Effectiveness of alerts when using a virtual ward:** evidence showing how monitoring alerts are used is needed to evaluate the effectiveness of the overall technology and the associated additional pathway costs and other resource requirements. This should include:
  - the types of monitoring alerts raised and how frequently these occur in practice
  - what response is needed to investigate the alert and how often this is completed in practice
  - how often an alert results in a change in clinical management
  - differences in technologies where this affects the number and type of alerts generated.
- **Costs and resource use, including virtual ward service delivery costs:** data on the cost of virtual ward provision should be collected to model resource requirements of establishing and running virtual wards. Assessment of resource use should consider both costs incurred by the provision of virtual wards and increased costs incurred by the wider healthcare system, including primary care.
- **Number of contacts with other healthcare providers:** evidence on the frequency of contact with other healthcare providers such as GP visits, home visits and calls to 111 is needed to assess how virtual wards would be expected to affect healthcare demand in other settings and their resource impact on the pathway.
- **Demographics and clinical characteristics of those admitted to a virtual ward:** this is

needed to understand how suitability for virtual wards is defined, and for more robust assessments of impact when comparing people whose care is managed on virtual wards with people having standard care. It would also allow investigations of the effectiveness of, uptake of, and adherence to virtual wards for key population subgroups.

- **Patient, carer and healthcare professional experience and acceptability:** this information is needed to understand the experience of patients and carers having care on virtual wards, including the acceptability of care and the carer burden, and the experience of healthcare professionals delivering care on virtual wards.

3 Approach to evidence generation

3.1 Relevant evaluations

Published academic evidence

Few relevant studies specifically consider the cost effectiveness of virtual wards for acute respiratory infections, as noted in the guidance supporting documentation. There is more published academic evidence for hospital-at-home care, usually in frailty pathways, as this area has been operating for longer. However, older studies may not use the same remote monitoring technologies that are now available.

Academic Health Science Network or provider rapid evaluations

Several rapid evaluations commissioned by NHS England looked at virtual ward care, including in COVID-19 or respiratory pathways. These evaluations, typically done by Academic Health Science Networks, adopted mixed-method approaches to investigate patient experiences qualitatively and financial impact quantitatively. Future studies could improve on these rapid evaluations by collating more robust cost and effectiveness data, for example, by using costs derived from actual expenditure rather than averages based on average bed-day costs. Evaluations took place in the following locations:

South West London

The Health Innovation Network did a rapid evaluation of 3 virtual wards in Kingston and Richmond, Sutton, and Croydon. Kingston and Richmond and Croydon wards included respiratory pathways, including COVID-19 and chronic obstructive pulmonary disease. The evaluation adopted a mixed-methods approach, considering qualitative data on experience and implementation and some quantitative savings estimates.

Further evaluation work among Health Innovation Network members is ongoing across London, developing minimum datasets and other activities to support future evaluation.

Norfolk and Norwich

Initially focused on COVID-19, this virtual ward was expanded to other pathways. The evaluation, carried out by Norfolk and Norwich University Hospital and the local integrated care system (ICS), also follows a mixed-methods design. It includes qualitative patient experience data and estimates cost per patient for virtual ward care compared with an inpatient alternative.

Mid and South Essex

NHS England commissioned an initial qualitative evaluation from Deloitte. This was later supplemented by Mid and South Essex ICS who commissioned Newton Europe to evaluate the benefits of virtual wards, including outcomes such as bed-day savings.

Cheshire and Merseyside

A collaborative effort by the Innovation Agency, Applied Research Collaborative Northwest and local ICS members collected qualitative data on several pathways, including acute respiratory infection.

Getting It Right First Time

Getting It Right First Time (GIRFT) have produced practical guidance on Making the most of virtual wards. It describes how the NHS can better use virtual wards. This summary guidance includes definitions of virtual wards and contrasts with other care settings, links to evidence and other resources, and information about virtual ward pathways.

Health Foundation

The Health Foundation's Improvement Analytics Unit is conducting an evaluation of frailty virtual wards, working in collaboration with the NHS England virtual wards programme team and local frailty virtual ward implementations. The evaluation will describe the characteristics of people admitted to the virtual wards and look at their typical trajectories of care. This will include examining medical histories before referral, as well as post-discharge outcomes such as rates of readmission or admission to hospital and the length of any subsequent hospital stays. The evaluation will also explore the feasibility of comparing individual-level outcomes with equivalent inpatient care. A previous qualitative evaluation (the Health Foundation's How do the public and NHS staff feel about virtual

wards) was also done to investigate people's attitudes towards virtual wards.

3.2 Study designs

To address the evidence gaps outlined in section 2, a prospective, comparative before-and-after study design is suggested. This design can help maintain consistency in processes, staff, protocols and equipment used, but does not account for changes that occur over time and is limited in providing head-to-head comparisons between the different types of virtual ward platforms.

The study should compare people who are having care before the virtual ward technology is implemented (in inpatient secondary or community care) with people subsequently having care through the virtual ward technology across the same services. Comparisons in outcomes should be made between people who would have been eligible for care through virtual wards before implementation and people eligible for care through virtual wards after implementation.

Ideally, this study would include a comparison with a similar service that did not implement virtual wards during the same period, to assess for background changes in patient outcomes over time. Ideally, there would also be longer-term follow up to evaluate patient outcomes over a period after the end of virtual ward care.

Differences between 'step-up' and 'step-down' models of virtual ward care should be considered because these groups may have different clinical characteristics, resource requirements, and possibly be impacted differently by the technology.

Data that can enable matching or adjustment techniques should be collected to balance observed characteristics, creating comparable cohorts and reducing bias from observed sources of variation. Relevant confounding factors should be systematically identified with input from clinical experts.

A mixed-methods study embedded within this approach is also suggested to provide qualitative evidence on individual, carer, and healthcare professional preferences. This study should include patient, carer, and healthcare professional experience using the technologies and their acceptability. It should also consider additional burden for carers.

3.3 Data sources

NHS England is constructing a template for a national virtual ward minimum data set, with links to the current Community Services Data Set, and possibly to Patient Level Information and Costing System (PLICS) submissions. The proposed draft minimum dataset currently includes operational fields describing the pathway, such as admission and discharge dates and locations, source of admission, and identifiers for the ward and provider. It also includes clinical fields such as diagnosis codes and the diagnosis coding scheme, procedure codes, dates of procedures and the procedure coding scheme. The draft would also include demographic fields such as gender, age, ethnicity and location, which could be used to derive socioeconomic status. These demographic fields would allow for subgroup analyses and differential effects. Outcomes would include mortality as well as derived fields such as length of stay, virtual ward occupancy and readmissions.

This minimum dataset may be a good data source for subsequent evaluations, especially if providers can give appropriate coding depth in clinical diagnosis and procedure codes. These codes could be used for more robust matching or adjustment approaches in addition to the age and sex-matching used in literature.

Subnational secure data environments (SDEs) may also be a useful source of information if they have comparable data. They may also be ready sooner than the national dataset if there are operational reasons for faster adoption, for example, giving individual members access to dataflows from other organisations in their ICS. There would potentially be a trade-off between speed of collection and data quality if subnational SDEs do not initially collect or seek to collect all the items in the proposed NHS England virtual ward datasets.

In addition to the proposed core minimum virtual ward dataset, NICE recommends linking virtual wards to PLICS costing, as is the case for admitted care.

3.4 Minimum dataset

NICE recommends collecting the following data fields as part of the national minimum dataset or via another source:

- **Admission and discharge dates from virtual wards:** this would allow the derivation of stay length and the ability to analyse change through time.
- **Source of admission:** this would allow subgroup analysis of different referral routes.

This field, or an additional field, could be used to differentiate between step-up and step-down care. Evaluations of virtual wards would need to analyse these 2 pathways separately.

- **Deaths within 30 or 60 days of admission onto a virtual ward:** this could be recorded via linkage with other datasets, for example, death data from the Office for National Statistics.
- **Whether the virtual ward spell was preceded by an earlier virtual ward stay within 30 days:** this would allow the calculation of readmission rates to virtual ward care, to evaluate readmission risks and pathway resource requirements.
- **Whether the virtual ward spell was followed by admission to inpatient care within 30 days:** this would allow the calculation of risk of escalation to inpatient care, and the resource implications of pathways where people require inpatient care following a virtual ward stay.
- **Cost of virtual ward spell (linked via PLICS):** stay level costs would require additional data collection and amendments to the process but would allow those evaluating virtual wards to better understand the costs of care provision.
- **Demographic information, including gender, age, ethnicity and socioeconomic status:** this data would be required for matching or adjustment approaches and would also allow studies to do subgroup analyses.
- **Diagnostic and procedure information:** this should be encoded in a recognised clinical coding system, for example, ICD diagnostic codes, OPCS procedure codes, or SNOMED codes. Scores from the National Early Warning Score tool could also be collated for purposes of measuring acuity. This information would give a better understanding of the healthcare needs and characteristics of virtual ward patients. It would also allow virtual ward cohorts to be better matched with an inpatient comparator group.
- **Qualitative data on patient, carer and healthcare professional experience and acceptability:** this data would best be captured separately rather than as part of a large quantitative dataset. However, it would be important to better understand the views of patients, carers and healthcare professionals alongside quantitative results.

To provide a comparator to inpatient care, it would be helpful for this cost data to be similar to inpatient care cost datasets.

Cost data should be provided at the patient or stay level. Current cost calculations are typically based on simulated modelling or a cost-per-bed-day or cost-per-contact basis. Reporting average costs for inpatient or virtual ward stays risks an inappropriate cost comparison. While all virtual ward patients should be those who would otherwise be admitted to hospital, it is conceivable that they may have fewer healthcare needs than the average inpatient stay. Consequently, simple (naive) comparisons between virtual ward and inpatient outcomes and costs would overstate virtual ward benefits, as the most acute inpatients may not be suitable for virtual ward care.

4 Implementation considerations

4.1 Funding

The National Institute for Health and Care Research's Health and Social Care Delivery Research programme will be reviewing the evidence gaps that might fall within their remit.

4.2 Implementation considerations

To enable safe and effective implementation of these technologies, the evidence generation study should ensure:

- Interoperability of the virtual ward platform with local health records, so that healthcare professionals have timely access to data from ongoing patient monitoring.
- Healthcare professionals have adequate training in the use of these technologies.
- Clear information and adequate support is provided to patients and their carers.

Key challenges to implementing the collection of sufficient data to inform evaluations include:

- Cost and resource requirements of collecting data and implementing the required standards and definitions.
- Heterogeneity in possible virtual ward models, which may include multiple treatment pathways, step-up and step-down care models and differences in admission criteria. This also includes potential differences in technologies used, for example, whether technologies offer continuous or intermittent monitoring, and what level of adherence is achieved for wearable devices.
- Low levels of occupancy in virtual wards that are yet to fully roll-out or reach their target capacity may mean that conclusions from early operations may not be transferrable to later, more mature operating models and activity levels.
- The development of standardised definitions and guidance for recording virtual ward spells and the relationship to inpatient care. For example, early step-down virtual ward

recording differed in whether the inpatient episode ended on transfer to a virtual ward or on discharge back to primary care. Adequate guidance and recording standards would need to be developed and taken up by virtual ward operators.

- The ability to set up and maintain data flows to automate and submit required data, and the compatibility of electronic patient records and other systems used to collect data. Interoperability of clinical informatics systems is important for safe and effective implementation, and subsequent evaluations of outcomes. However, virtual ward providers may need resources and time to set up such data sources.
- Technologies and systems used to facilitate virtual wards should have appropriate licencing and standards.
- Implementation may have an additional burden on clinical staff, for example, the need to have training before implementation, data collection and follow up.

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