Review Article

What is the evidence base for ambulatory care for acute medical illness?

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Abstract

Acute ambulatory care is a critical component of the emergency care pathway with national policy support and a dedicated NHS Improvement network. The evidence base for treating acute medical illness outside hospital is a diverse mix of randomised and observational studies with varying inclusion criteria, prognostic stratification, interventions and healthcare setting which limits synthesis of all available evidence and translation to the UK context. There is little consensus on the level of risk for home-based treatment for acute medical illness. Selection tools for referral to acute ambulatory care have been developed but there is limited evidence for their use. There are still research questions concerning optimal staffing, referral mechanisms, point of care diagnostic portfolio and tools for shared decision making.

Keywords

Ambulatory Care; Evidence; Policy; Prognosis

Key points

- Observational studies that describe processes of care and prognosis can support discharge decisions for acute medical illness.
- There is no consensus on the level of risk that is appropriate for home-based care as opposed to hospital admission for acute medical illness
- Although policy and guidance have developed without a large evidence base of randomised trials, there is a role for research to optimise the design and delivery of ambulatory care

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Background

The acute medical care system faces a challenge of increasing demand for same day assessment and treatment on the backdrop of a fall in the number of hospital beds.[1] The available pool of acute hospital beds is further reduced by delayed transfers of care, which in turn slows the flow through acute assessment facilities at the front door - the emergency department (ED) and acute medical units (AMUs) causing over-crowding which is a risk to patients and staff.[2] This fixed capacity system can become rapidly overwhelmed during surges in demand, which are often relentless during winter months.[3]

In order to develop a sustainable acute medical system, innovation in delivering processes of care is needed. The Royal College of Physicians Future Hospital Programme had a focus on care model design and aimed to deliver more acute treatment outside the hospital.[4] This was echoed in the NHS England Five Year Forward View[5] and further steps are being taken to promote ambulatory care through NHS Improvement's Ambulatory Emergency Care (AEC) network.[6] Furthermore, there is growing commentary based on observational data of potential harms of hospital based care provision,[7] adding to the impetus to seek credible alternatives to hospital care.

What is the evidence base for the current ambulatory care strategic policy and quality improvement initiatives? And do we know how best to implement that evidence to deliver a cost-effective system of acute ambulatory care with optimal referral mechanisms, staffing skill mix, diagnostic test provision and follow up models?

Taxonomy of models - replacing a hospital bed with the patients' bed

Ambulatory care delivers acute medical care without staying in hospital overnight. This in itself is a broad definition and can encompass patients who are initially seen in an acute setting but then have a variable intensity of follow up, from one visit only through to multiple daily visits. However, it includes patients treated through a 'hospital at home' service who are also receiving care for acute medical illness without admission. The level of initial diagnostic work up and intensity of monitoring in a hospital at home model depends on the point in the care journey at which a patient is referred - which can include a team arriving at the patient's home or care home after a call for help, through to early supported discharge after initial assessment and treatment at an acute hospital.

NHS Improvement has a focus on supporting ambulatory care units to identify patients with acute

illness who are at low risk of clinical deterioration, and deliver rapid diagnostics to support senior led decision making.[8] Therefore evidence from other healthcare settings also needs to be applicable to this platform of care if it is to inform the optimal delivery of acute ambulatory care within the current NHS.

In a recent overview of all available systematic reviews of treating acute illness in adults without admission to hospital, the published evidence was distilled into four care models.[9]

1. Hospital in the home, delivering hospital level processes of care such as intravenous treatment within the patients' home environment, with an evidence base comprising a range of acute medical conditions.[10]
2. 'Quick decision units', which offer intensive diagnostics and senior decision makers, although the only available evidence was from different cities within Spain and had a focus on earlier diagnosis of cancer.[11]
3. 'Out-patient care' which uses the existing care delivery structures of the emergency department (ED) or traditional out-patient clinic but instead of arranging admission after diagnosis of an acute medical illness, patients are sent home instead. Individual studies using this model recruited patients with specific conditions such as pulmonary embolism (PE)[12] or community acquired pneumonia (CAP), with most evidence generated from studies recruiting patients in the ED.[13]
4. Observations units[14] which assess, treat and monitor patients for *up to* 48 hours before sending patients home, and are usually attached to, and staffed by, the ED. Given the prevalence of presenting conditions in the ED, the evidence in this care setting includes studies recruiting patients with chest pain.[15] As the length of stay on these units included overnight admission, their impact is more on reducing overall length of hospital stay rather than avoiding admission altogether.

Observational studies and randomised studies – evidence for a care model or evidence for a discharge decision?

The evidence base on treating acute illness outside hospital includes observational studies of ambulatory care models operating within routine healthcare delivery,[9] even for high impact journals.[16] In general, the evidence for organisation and delivery of care consists mainly of observational studies, as found in the evidence searches for all questions in the recently published National Institute for Health and Care Excellence (NICE) guideline NG94 on organisation and delivery of emergency and acute medical care.[17]

Observational data makes comparisons between patients treated in hospital and community-based care harder to interpret because in routine care, clinicians will be selecting patients for either hospital treatment or home treatment partly based on their impression of prognosis. As a result, ambulatory care could appear to be safer than in patient care because lower risk patients are sent home and higher risk patients admitted (termed 'confounding by indication').

A randomised study however, effectively evens out factors that could be affecting prognosis in the home and hospital settings and is a fairer test of whether treating acute medical illness at home is equivalent in terms of effectiveness compared with acute hospital care. Randomisation is also a fairer test of cost-effectiveness in a comparison with home care, because it will reduce the chance that patients with a higher risk of complications or need for escalated care will all be in the hospital treated group.

Different care models have differing amounts of randomised evidence for their use. The hospital at home evidence base has the highest proportion of randomised trials,[10] quick decision units have only observational data,[11] and there is a mix of randomised studies and observational studies for both out-patient care models and observation units. There is debate about how best to synthesise results from these different research designs so that we can learn the most from all published evidence. A recent Cochrane overview of reviews compared results from randomised studies and observational studies and found that effect estimates were fairly similar,[18] although these studies were mainly for simple interventions such as medications, which are not as complex as delivering a new model of acute care. Nevertheless, is the lack of randomised studies a problem?

Randomised studies are not always useful for front door decision makers faced with a full hospital, as the balance of risk and benefit of admission is altered by the increased chance of admission related harm.[19] In addition, there are usually strict criteria for entry into a randomised trial and evidence may not easily translate to supporting decisions on location of care if the patient in front of you would not have been recruited into a trial of out of hospital care.

However, a study that demonstrates which patients did not deteriorate over time, wherever they were treated, and how they were treated, offers more help to the decision maker at the front door of a full hospital. Our main question in the context of an acute hospital system that is dangerously full is "which patients can we send home?". This is different from establishing the clinical and cost-effectiveness of home treatment delivered through a new care model compared with hospital treatment,

as we wish to identify patients who are unlikely to deteriorate on an established treatment. For the discharge question, robust and transparently reported observational studies are useful if they show the factors which determine a good outcome during the course of treating an acute medical illness and the processes of care used to treat that illness.

Therefore, whilst randomised studies of care models answer questions about their overall cost-effectiveness which may be needed in healthcare planning, high quality observational studies answer questions about prognosis which can also inform decisions over location of care.

Is there a consensus level of risk for acute care outside of hospital settings?

There are several sources of evidence that point to a lack of consensus on risk for acute treatment in out of hospital settings. Firstly, there is a significant variation in the proportion of patients that different physicians select for treatment at home compared with continued treatment in hospital. The elegant study by Beckett *et al* demonstrated that over two years, and balancing out differences in case mix, the proportion of patients discharged by individual consultants after initial assessment varied from 24% to 47%.[20] This suggests that individual clinicians operate at a level of risk that feels appropriate for them, across many presenting conditions and sets of social circumstances. As a phenomenon, this individual physician variation in risk tolerance has been observed in other healthcare settings,[21] and also in risk management in urgent primary care, for general practitioners undertaking home visits in an out of hours service.[22]

Secondly, the level of mortality that is deemed suitable for home treatment differs across clinical prediction rules. The Pulmonary Embolism Severity Index (PESI) and its simplified version (sPESI) have a 30 day mortality of 1% at the cut points for discharge from hospital after initial assessment for a patient with pulmonary embolism.[23] The NICE guidelines for community acquired pneumonia support decisions for home based care for patients with a CURB-65 score of 0 or 1 which has up to 3% mortality at 30 days[24 25] (The British Thoracic Society Guidelines in 2009 permitted supervised ambulatory care for a CURB-65 score of 2, which in the original validation had a mortality of up to 9%[24]). The Glasgow-Blatchford score for upper gastro-intestinal bleeding has a 0% 30 day mortality at its recommended discharge score,[26] although there has been some interest in increasing the level of this score to balance benefits of a reduced volume of hospital admissions with a low but non-zero risk in ambulatory patients.[27 28]

If clinicians vary in discharge decisions, and prediction rules vary in level of risk for acute care outside hospital, then we should look to shared decision making with patients, and understand what level of risk patients feel is appropriate for them on deciding location of care.[29] Whilst clinicians may focus on mortality, other outcomes may be more meaningful for patients, depending on the clinical context. The introduction of shared decision making in acute low risk chest pain reduced investigations and hospitalisation without an increase in harm,[30] suggesting that this is feasible as well as beneficial to patient and health system. Further research is needed to understand how best to present and discuss risk associated with location of care in the setting of a range of acute illnesses and then to incorporate this into a shared decision on subsequent management.

Selecting patients for referral to ambulatory care units

There are two strategies to identify conditions that are suitable to be seen on ambulatory care units – either to use the research evidence for single conditions that have outcomes for ambulatory treatment, or to define an overall set of risk criteria across all presentations, where there are no immediate features that argue for in patient care. Although some authors refer to 'ambulatory care sensitive conditions',[8] these are in fact diseases where better community care could prevent hospital admission, rather than identifying diseases that are suitable for acute ambulatory care.[31]

NHS Improvement's AEC Network[6] and the Royal College of Physicians Ambulatory Care Toolkit[32] recommend patient selection tools to support the identification of patients who are suitable for ambulatory care. There are two potential clinical prediction rules to support identification of patients who can be streamed from the incoming medical workflow onto an ambulatory unit, due to determining a high likelihood of not requiring in patient admission.

The Ambulatory (AMB) score[33] was derived and validated in patients referred to one medical assessment unit. Routine clinical data from 282 patients were used to identify variables which were associated with being discharged home on the day of referral to the acute medical team and the predictive factors were included in a score, which was then tested on 343 patients. The Glasgow Admission Prediction (GAP) score[34] was derived and validated in patients attending emergency departments in different hospitals in one city over a two year period. Routine healthcare data from 212,351 patients were used to create the GAP score that predicted discharge home from the emergency department, irrespective

of the presenting complaint, and this was then tested on 107,615 patients.

Both these scores have their strengths and limitations. The AMB score is applicable to patients who are referred to an acute medical team, as this is the derivation setting for the score.[33] For triage teams in acute care, this rule could be utilised to help decide if patients should be directed to AMU or to ambulatory care. However, it was derived and then validated in one centre only, which limits generalisability and the pool of recruited patients for this study was small. The GAP score had a multicentre derivation and validation, which enhances generalisability, and has almost 1000 times more patients for its derivation and validation. However, the GAP score applies to all adult patients who attend the ED and are discharged by ED or by any specialty review, rather than those who are solely referred to medicine.[34]

The AMB score has been externally validated (i.e. tested in a population separate from its derivation setting) among acute medical referrals against the outcome of same day discharge.[35] It was found to perform less well than in its original derivation study due to a high false positive rate of 60% i.e. among patients in whom the score predicted same day discharge, more than half stayed overnight in hospital.[35] This would make the score less useful in triaging patients to an ambulatory care unit as the majority may go on to need overnight admission.

In a multicentre validation study of both AMB and GAP scores, the GAP score showed a greater ability to predict same day discharge.[36] However, this study was undertaken in the ED setting at initial triage and was not limited to patients referred for acute medicine. In general, prediction scores will always perform better in settings that are similar to their derivation,[37] so we would expect the GAP score to outperform AMB when applied to all adults attending ED triage. This does not mean that GAP is better than AMB for selecting patients for ambulatory care from all primary care and ED acute medicine referrals.

However, the main criticism of both these scores is that they predict a process outcome, namely same day discharge, rather than a clinical outcome such as successful treatment on an ambulatory pathway over a number of days. These scores are designed to detect all patients who are sent home after initial assessment, irrespective of subsequent clinical outcomes. Therefore, they do not flag high risk patients who are sent home after initial assessment and deteriorate. If an ambulatory care score predicted successful treatment without any hospital admission, rather than simply going home after initial assessment, then it would capture the ideal ambulatory work flow.

Implementing evidence for ambulatory care

The evidence for different models of ambulatory care is collectively built up from trials that often recruit patients with single conditions. This has implications for how we can use the evidence base to plan the staffing skill mix, range of conditions accepted for referral and diagnostic access for ambulatory care units. The extent to which research informs guidance and practice however is highly variable, as the following examples show.

The evidence base for ambulatory treatment of chemotherapy induced febrile neutropenia (CIFN) shows a sequential pattern of randomised trials[38] followed by observations of implementation of the trial design in routine care. The trials which collectively show equivalent outcomes incorporate an element of risk assessment to select patients for immediate discharge home, using a risk stratification score such as the Multinational Association of Supportive Care of Cancer (MASCC) index.[39] The subsequent observational evidence base confirms that implementation of the MASCC index supports clinically effective ambulatory care in routine practice.[40] However, observational evidence for implementation may be subject to publication bias as pilot services which are not effective may not be written up for publication.[41]

This contrasts with the evidence base for ambulatory treatment of PE, which has very few trials which randomise patients to home or hospital.[12] There is one trial that used the PESI score to ensure that low risk patients were randomised to either home or hospital (with all higher risk patients being admitted)[42] so that outcomes could be fairly compared. The other evidence is observational and often embedded in larger randomised treatment trials such as EINSTEIN PE, where retrospectively applied PESI scoring is validated against physician choice of location of care in both arms of a randomised treatment comparison.[43] In spite of the Cochrane review of ambulatory treatment concluding that more evidence is needed before recommending out-patient treatment of pulmonary embolism,[44] clinical care and guidelines have progressed to support ambulatory care, based on an observational evidence base.[45 46]

Future opportunities for research

There are still uncertainties about optimal ambulatory care delivery and therefore opportunities for research to improve care. Very little is published on the patient and carer experience of acute ambulatory care, yet in other emergency services, patient experience has been used successfully to design care delivery.[47] The inclusion of older

patients living with frailty is highly variable, with the Ambulatory Emergency Care Network case reports showing average ages of ambulatory patients in the 50s,[48] yet other published data shows units with a median age of 81.[49] Given the substantial benefit of delivering comprehensive geriatric assessment for acute frailty syndromes in the hospital setting,[50] we need to understand how this can be incorporated into ambulatory care provision.

The provision of rapid diagnostics is emphasised in guidance,[6] yet we don't know the extent to which point of care testing (both range of blood analytes and ultrasound provision) is available within ambulatory units. Furthermore, the appropriate clinical leadership, skill mix and staffing ratios for ambulatory care units have yet to be determined.

Finally, there has been very little published data on longer term clinical outcomes after acute ambulatory care assessment and treatment. NHS Improvement does not include these in its essential measures of ambulatory care,[46] yet they are beginning to be reported[49] and therefore need to be explored as a marker of care quality.

Patients, carers, clinicians and arms' length bodies of the Department of Health and Social Care should determine priorities for research questions that can be taken to funders so that the UK can rapidly develop the ambulatory component of a sustainable acute care system.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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