Evidence check

25 July 2022

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Alternative models of care for acute medical conditions

Evidence check question

What is the evidence for alternative models of care for managing patients with acute medical conditions outside of emergency or inpatient hospital settings?

Summary

This evidence check included 57 peer-reviewed articles on alternative models of care for managing patients with acute medical conditions, published since 2016. Based on an earlier systematic review and search results, the models were categorised into five categories: outpatient care models, hospital at home care models, quick diagnostic units observation units and general practitioners or specialists in the emergency department.

Evidence generated on alternative models is often context dependent, particularly with respect to country, organisation and funding, collaboration between hospital, primary care and other community or residential aged care services and patient population. This leads to difficulty in generalising findings.

Overall, alternative models of care can be promising in terms of reducing presentations to the emergency department and subsequent admissions, especially for younger and otherwise healthy individuals without comorbidities.

Synthesised literature

Outpatient care models

Outpatient care models refers to emergency department or clinic assessment and treatment with close outpatient follow-up. This type of model appears appropriate for avoiding emergency department presentation or inpatient admission in otherwise healthy patients presenting with one main acute illness. Such clinics usually have a condition-specific protocol or pathway that is followed.

- Examples of clinics reported to be effective in reducing presentations to emergency, admissions, length of stay and/or cost savings, include:
  - a diuretic lounge to manage heart failure[1]
  - an outpatient, acute surgical review unit with ultrasonography[2]

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  - outpatient fracture management pathway[3]
  - an ambulatory medical ward to manage acute tonsilitis[4]
  - a hot clinic for outpatient management of critical limb ischaemia[5]
  - a 24 hour access outpatient clinic for patients with exacerbation of chronic diseases, including chronic obstructive pulmonary disease and heart failure[6]
  - discharge home with outpatient follow up, rather than admission for monitoring, in patients presenting to emergency with chest pain who were not diagnosed with an acute myocardial infarction[7]
  - outpatient management of mandibular fractures, uncomplicated acute diverticulitis, acute venous thromboembolism[8-10]
  - placement of a hospital-based, out of hours, paediatric general practice service next to an emergency department.[11]
- Examples where the evidence was more equivocal included:
  - outpatient treatment of acute pulmonary embolism, for which there was positive (however, low quality) evidence that outpatient treatment was effective[12]
  - a rapid access outpatient clinic for heart failure patients after emergency presentation, which did not decrease readmission rates.[13]

Hospital at home care models

Hospital at home care models appear to be safe and effective at reducing length of stay in hospital in many cases, as reported by systematic reviews.[14, 15] However, for patients with multiple medical conditions, they may increase the risk of readmission.[15]

- There is less certainty in the effectiveness of hospital at home models for patients over 75, who have dementia or multiple comorbidities, or in cases where there are concerns over home situation and/or social support.[14]
- Not all interventions in residential care facilities result in decreased hospitalisations.[16, 17] This may relate to the complex presentation of the residents, or in some cases to implementation strategies failing.[17]
- Hospital at home care models are not appropriate in acute stroke management.[14]
- In a comparison of two different hospital at home models, patients managed by a general practitioner were less likely to require hospital admission than those who were managed by a hospital-based specialist.[18]
- Examples of hospital-at-home management alternatives which do appear to reduce presentations to emergency and admissions, as well as create cost savings, include:
  - a rapid response team, consisting of a nurse, specialist paramedic and physiotherapist, who provide 24-hour assessment and care at home for over 65 year olds[19]
  - a multidisciplinary, geriatric specialist team managing medical and orthopaedic conditions[20]
  - a community palliative care service with extended operational hours[21]
  - emergency services callouts accompanied by general practitioners[22]
  - home treatment for acute mental health crises[23]

  - management at a community mental health clinic[24]
  - paediatric home-based intravenous antibiotic therapy.[25]
- For patients living in residential care, the following have demonstrated effectiveness in reducing emergency presentation and hospital admission:
  - virtual care assessments with emergency physicians, for older patients with acute illness living in skilled-nursing facilities[26]
  - a proactive (rather than reactive) model of palliative care to identify residents who had high symptom burden or were at risk of dying without a palliative care plan in place[27]
  - a model to care for acutely unwell residents in place which was nurse and geriatrician-led and also incorporated an inpatient liaison nurse consultant[28]
  - a nursing-led, multi-strategy intervention in residential-aged care facilities, which did not reduce emergency attendance but did reduce the need for inpatient admission.[29]
- Hospital at home models which create other or indirect benefits include:
  - discharge home from emergency with a care transition package, which resulted in further emergency presentations being less likely to require hospitalisation[30]
  - discharge home from emergency for multidisciplinary hospital-at-home management of infections, heart failure, chronic obstructive pulmonary disease and asthma, which led to reduced cost, healthcare use, and readmissions, while increasing physical activity[31]
  - a rapid response, geriatrician-led, multidisciplinary team providing comprehensive geriatric assessment, which led to reduced admissions to residential care[32]
  - a hospital at home service for veterans was not associated with changes in readmission rates but was significantly lower cost than managing similar patients on the acute wards[33]
  - another hospital at home service for over 18-year-olds was not evaluated for admission rates but was associated with lower costs.[34]

Quick diagnostic and observational units

Quick diagnostic and observational units involve patients staying in the hospital for up to 48 hours for investigations, followed by rapid discharge home. This appears most effective when patients are placed on a condition-specific pathway or protocol.

- Quick diagnostic units appear to be a cost-effective resource for avoiding unnecessary hospitalisation in patients with anaemia and cancer.[35, 36]
- Observation units evaluated as a model of care for all patients have been associated with reduced inpatient admission rates,[37, 38] increases in patient satisfaction scores[39] and improved care.[38]
- Observation units have also been evaluated for the management of specific illnesses. This is typically done in an observation ward that would accept a range of patients, but then use a protocol or pathway for that particular patient's condition.
- Observation units have been effective in reducing unnecessary admissions and reducing length of stay for:
  - vaso-occlusive events in sickle cell disease[40]
  - atrial fibrillation[41]
  - acute exacerbations of chronic obstructive pulmonary disease[42]

  - paracetamol overdose[43, 44]
  - abdominal pain.[45]
- 'Municipal acute bed units' in Norway are a similar concept. They provide short stays in local community hospitals under the management of primary care and reduce the need for inpatient admission.[46]
- Units which only admit specific populations, such as psychiatric observation units, geriatric observation units, and paediatric observation units can also result in a reduced length of stay and reduced inpatient admissions. [47-49]
- Poorer outcomes: Patients with syncope on the observation ward, have been noted to be less likely to have a diagnosis upon discharge, compared to a similar length of stay on an inpatient ward.[50]

Specialists or general practitioners in the emergency department

Models of care which place specialists or general practitioners in the emergency department report variable effectiveness at reducing admissions, and may have greater effectiveness for paediatric, geriatric populations or regional settings.

The following interventions appear to be effective:

- early geriatric specialist care at the point of entry at emergency[51]
- specialist geriatric nurses assisting to manage high-risk, elderly patients in emergency[52]
- a paediatric emergency care access point, coordinated collaboratively by general practitioners and emergency department staff[53]
- employing general practitioners in rural and regional hospitals, which can fill the gaps in the delivery of acute care, emergency medicine and maternity care as well as improve the quality of referrals.[54]

The following have limited or poor evidence:

- embedding an oncologist in an emergency department to review incoming patients with solid tumours[55]
- embedding general practitioners in hospital emergency departments to provide care for patients with non-urgent health problems (systematic review).[56]

Other models

Another model which has been associated with reductions in inpatient admissions is a short term, community based, residential service for patients requiring mental healthcare.[57]

Limitations

Alternative models of care are referred to by numerous names. The most commonly used names were previously identified in a systematic review and adopted here. However, this evidence check may not have identified all relevant published articles on this topic from settings where other, more infrequent terminology is adopted.

Given the volume of published literature on the topic, studies were limited to systematic and scoping reviews, and experimental studies which included a control or comparison group. A number of studies which discuss the development and piloting of novel alternative models of care for acutely unwell

patients were thus excluded. Therefore, this evidence check may not include an exhaustive list of organisational models of alternative care.

Background

- Reducing unnecessary or preventable presentations to emergency, as well as subsequent inpatient admissions for acute illness, can relieve pressures on busy services.
- Alternative models of care, or different ways to provide healthcare in various settings, are ways of reducing inpatient admissions or length of stay in hospital.
- Hospital at home services are already used in some settings in NSW. They can provide acute or subacute care (such as intravenous medications) in a patient's home. They have been associated with successful outcomes and low rates of patients requiring subsequent admissions. Hospital at home services can also avoid many risks associated with being cared for in the hospital setting.[58]
- The European Federation of Internal Medicine (EFIM) Working Group on Professional Issues and Quality of Care, for example, has issued a position statement, advocating for changes in hospital ambulatory management strategies in order to avoid unnecessary inpatient admissions, and for increased education on these issues.[59]
- This evidence check aims to update the literature published since a systematic review on alternative strategies to inpatient hospitalisation was published in 2016.[60] The review found that for low-risk patients with a range of acute medical conditions, the alternative management strategies to inpatient care can achieve comparable clinical outcomes and patient satisfaction at lower costs (however, not for return rates of hospitalisation in chemotherapy-induced febrile neutropenia).[60]
- A range of terminology is used internationally to reflect alternate levels and models of care. This evidence check adopts and expands on the four models identified by a 2016 systematic review on this topic:[60]
    - **Outpatient management**: emergency department or clinic workup and treatment with close outpatient follow-up
    - **Hospital-at-home**: evaluation in the emergency department or clinic, followed by delivery of inpatient-level care within the patient's home
    - **Quick diagnostic units**: organised clinics that obtain rapid diagnoses for serious illnesses
    - **Observation unit**: protocol-driven management for up to 24 to 48 hours within a dedicated space with subsequent discharge for outpatient follow up.
- Based on search results, this evidence check also included evidence for models where (non-emergency) clinicians are placed at the triage point in emergency departments, to assist with multi-disciplinary triage or condition-specific advice to patients.

Methods

PubMed search on 31 May 2022, using terms and criteria described in Appendix 1.

Results

Table 1: Outpatient and hospital at home models

Note some of the information has been copied directly from the source material.

Source	Summary
Peer reviewed sources	

Early discharge hospital at home[15]
 	
Gonçalves-Bradley, et al. 2017
	• **Study type**: Systematic review.
	• **Methods**:
	  ○ **Aim**: To determine the effectiveness and cost of managing patients with early discharge hospital at home compared with inpatient hospital care.
	  ○ **Inclusion**: Randomised trials comparing early discharge hospital at home with acute hospital inpatient care for adults.
	  ○ **Exclusion**: Obstetric, paediatric and mental health hospital at home schemes.
	  ○ **Dates searched**: Up to 9 January 2017.
	• **Results**:
	  ○ Interventions evaluated were:
	  ▪ delivered by hospital outreach services
	  ▪ community-based services
	  ▪ coordinated by a hospital-based stroke team or physician in conjunction with community-based services.
	  ○ For stroke:
	  ▪ Hospital at home may lower the risk of living in institutional setting at six months (risk ratio 0.63) and may slightly improve patient satisfaction.
	  ▪ Hospital at home probably reduces hospital length of stay by about seven days.
	  ▪ No difference to risk of readmission.
	  ○ For patients with a mix of medical conditions:
	  ▪ The intervention probably increases the risk of hospital readmission.
	  ▪ Early discharge hospital at home may decrease the risk of readmission for people with chronic obstructive pulmonary disease.
	  ▪ Hospital at home may lower the risk of living in an institutional setting

	▪ The intervention might slightly improve patient satisfaction. ▪ The effect of early discharge hospital at home on hospital length of stay for older patients with a mix of conditions ranged from a reduction of 20 days to a reduction of less than half a day. ○ For patients undergoing elective surgery: ▪ Little or no difference in readmission to hospital for people who were mainly recovering from orthopaedic surgery. ▪ The intervention might slightly improve patient satisfaction. ▪ People recovering from orthopaedic surgery allocated to early discharge hospital at home were discharged on average four days earlier than people allocated to usual inpatient care. • **Conclusion**: Early discharge to hospital at home services is associated with reduced length of stay, however there is insufficient evidence of economic benefit or improved health outcomes.
A systematic review to identify and assess the effectiveness of alternatives for people over the age of 65 who are at risk of potentially avoidable hospital admission.[14] Huntley, et al. 2017	• **Study type**: Systematic review. • **Methods**: ○ **Aim**: to evaluate the effectiveness and cost-effectiveness of any community-based intervention offered as an alternative to admission to an acute hospital. ○ **Inclusion**: randomised or non-randomised controlled trial, population aged over 65 years, being considered for an unplanned admission, receiving either an acute admission or an alternative to acute admission. Studies commenting on intervention effectiveness in terms of patient's subsequent emergency department attendance or readmission, patient-related outcomes, safety or healthcare costs. ○ **Dates searched**: April 2005–December 2016. • **Results**: ○ Overall, alternatives to acute care at the point of potential admission for people aged over 65 years can be safe, with comparable mortality and clinical outcomes across a range of acute and chronic conditions. They also have the potential to reduce healthcare spending. ○ Patients with stroke, however, fare much worse with hospital at home interventions.

	○ The key features of older patients for whom the decision to admit may be uncertain are age more than 75 years, comorbidities, dementia, home situation, social support and individual coping abilities. • **Conclusion**: Many of the options available for hospital at home care are safe and appear to reduce resource use, except for patients with stroke.
Primary care professionals providing non-urgent care in hospital emergency departments[56] Gonçalves-Bradley, et al. 2018	• **Study type**: Systematic review. • **Methods**: ○ **Aim**: To assess the effects of locating primary care professionals in hospital emergency departments, to provide care for patients with non-urgent health problems. ○ **Inclusion**: Randomised and non-randomised trials, controlled before-after studies, and interrupted time series studies that evaluated the effectiveness of introducing primary care professionals to hospital emergency departments attending to patients with non-urgent conditions. ○ **Dates searched**: Up to 10 May 2017. • **Results**: ○ One randomised trial and three non-randomised trials were identified which evaluated the effects of general practitioners or emergency nurse practitioners providing care to patients with non-urgent problems in emergency. ○ The studies were conducted in Ireland, the United Kingdom and Australia, and had an overall high or unclear risk of bias. ○ It is uncertain whether the intervention reduced: ▪ time from arrival to clinical assessment and treatment or total length of emergency stay ▪ admissions to hospital ▪ diagnostic tests ▪ treatments given, ▪ consultations or referrals to hospital-based specialist ▪ costs. ○ The evidence was very low-certainty for all outcomes. No data were reported on adverse events (such as emergency returns and mortality).

	• **Conclusion**: The evidence is insufficient to draw conclusions for practice or policy regarding the effectiveness and safety of care provided to non-urgent patients by general practitioners and nurse practitioners versus emergency physicians in the emergency department.

Effects of employing primary care doctors in hospital to improve the quality of care and health outcomes of rural patients: A systematic scoping review[54]
 	
Sutarsa, et al. 2021
	• **Study type**: Systematic scoping review.
	• **Methods**:
	  ○ **Aim**: To describe effects of employing primary care doctors in hospital care and their roles in improving the quality of care and health outcomes of rural and remote patients.
	  ○ **Inclusion**: Peer-reviewed publications, identifying effects of employing primary care doctors in hospitals, all study types, studies involving rural or remote or regional locations or studies comparing urban or major city areas and rural or remote locations.
	  ○ **Exclusion**: studies that primarily discuss roles of primary care doctors in hospital care in major cities or urban or metropolitan areas.
	  ○ **Dates searched**: From 1990 to September 2020.
	• **Results**:
	  ○ Positive outcomes included improved access to specialised treatment, improved continuity of care, reduced waiting list and admission rates, improved skills, competence and confidence of primary care doctors, and increased satisfaction from health providers, patients and families.
	  ○ Negative consequences included increased prescriptions and poorly documented history and physical examinations.
	• **Conclusion**: Among other benefits, employing primary care doctors in hospital care can fill the gaps in the delivery of acute care, emergency medicine and maternity care as well as improve the quality of referrals leading to freed-up clinical capacity of tertiary hospitals to treat more serious conditions.

Inpatient versus outpatient parenteral antibiotic therapy at home for acute infections in children: a systematic review[25] Bryant, et al. 2018	• **Study type**: Systematic review. • **Methods**: ○ **Aim**: To review the efficacy, safety, satisfaction, and cost of home-based versus hospital-based intravenous antibiotic therapy for acute infections in children.

	○ **Dates searched**: Jan 1956 to Jan 2017 in MEDLINE and Jan 1974, to Jan 2017 in Embase. ○ **Participants**: Children below 16 years with acute infections. ○ **Outcomes**: Four outcomes were assessed: efficacy, safety, satisfaction, and cost. ○ **Comparison**: Home-based hospitals vs traditional hospital model. • **Results**: ○ Home-based outpatient parenteral antimicrobial therapy was cost-effective and satisfactory to patients and their families. ○ No study showed that home-based treatment was less safe than hospital-based treatment. ○ Home-based treatment was satisfactory to patients or their families and less expensive per episode than hospital-based treatment by 30–75%. ○ A potential disadvantage of home-based outpatient parenteral antimicrobial therapy is that patients treated at home might have a longer total duration of treatment than those treated in hospital. • **Conclusion**: Home-based treatment is efficient, safe, and satisfactory.
Emergency department transfers and hospital admissions from residential aged care facilities: a controlled pre-post design study[29] Hullick, et al. 2016	• **Study type**: Retrospective, observational cohort study from Australia. • **Methods**: ○ **Aim**: To evaluate a new collaborative model of care, the Aged Care Emergency Service. The service was developed to provide clinical support to nurses in residential aged care facilities, allowing residents to be managed in place and avoid transfer to emergency. ○ **Participants**: Acutely unwell residents of residential aged care facilities requiring transfer to emergency. ○ **Intervention**: The intervention consisted of: ▪ a clinical care manual to support care ▪ a nurse-led telephone triage line ▪ education ▪ establishing goals of care prior to emergency transfer ▪ case management when in emergency

	▪ the development of collaborative relationships between stakeholders. ○ **Comparison**: Residential aged care facilities without the intervention. • **Results**: ○ There was no overall reduction in emergency presentations with the Aged Care Emergency Service intervention. ○ The intervention group had reduced emergency length of stay by 45 min (p = 0.0575) and was 40% less likely to be admitted to hospital (p = 0.0012). • **Conclusion**: A complex multi-strategy intervention led by nursing staff can successfully reduce hospital admissions for older people living in residential aged care facilities. By defining goals of care prior to transfer to emergency, clinicians have the opportunity to better deliver care that patients require.
Effects of an Intervention to Reduce Hospitalizations From Nursing Homes A Randomized Implementation Trial of the INTERACT Program[16] Kane, et al. 2017	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**: ○ **Aim**: To determine whether training and support for implementation of a nursing home quality improvement program reduced hospital admissions and emergency visits. ○ **Intervention**: The intervention – interventions to reduce acute care transfers (INTERACT) – included: ▪ tools that helped staff to identify and evaluate acute changes in nursing home residents' conditions ▪ tools that helped document communication between physicians ▪ care paths to avoid hospitalisation ▪ advance care planning and quality improvement tools. ○ **Comparison**: Nursing homes without the INTERACT intervention. • **Results**: ○ Intervention was associated with a reduction in potentially avoidable hospitalisations overall (p = .01); however, this effect was not robust to a Bonferroni correction for multiple comparisons.

	• **Conclusion**: The intervention had no effect on hospitalisation or emergency visit rates in the overall population of residents in 85 participating nursing homes.

Diuretic lounge and the impact on hospital admissions for treatment of decompensated heart failure[1]
 	
Ioannou, et al. 2020
	• **Study type**: Retrospective, observational cohort study from the United Kingdom.
	• **Methods**:
	  ○ **Participants**: Patients presenting with heart failure, self-referred or referred by general practitioner, community nurses or other specialists.
	  ○ **Intervention**: Patients referred to a diuretic lounge. The service is run by cardiology ward nurses, based in the lounge, and supported by a heart failure clinical nurse specialist and consultant cardiologists.
	  ○ **Comparison**: Previous 12 month period where heart failure patients were referred to emergency.
	• **Results**:
	  ○ Significant decrease in emergency heart failure admissions compared to the previous 12 months ($p = 0.04$).
	  ○ Numerical reduction in readmission rates (17.3% versus 16.2%).
	  ○ The 13.1% decrease in admissions lead to financial savings of £315,497 per annum and £2,921 per admission avoided.
	• **Conclusion**: Managing heart failure patients in a specialist diuretic lounge rather than emergency department is associated with reduced admissions and cost savings.

Emergency Department Interventions for Frailty (EDIFY): Front-Door Geriatric Care Can Reduce Acute Admissions[51]
 	
Chong, et al. 2021
	• **Study type**: Retrospective, observational cohort study from Singapore.
	• **Methods**:
	  ○ **Participants**: Patients over 85 years old presenting to emergency.
	  ○ **Intervention**: Early geriatric specialist interventions in the emergency department and early identification of patients for safe discharge or transfer to lower care settings.
	  ○ **Comparison**: Usual care in emergency.
	• **Results**:
	  ○ Thirty-five (81.4%) participants in the intervention group successfully avoided an acute admission.

	○ All participants in the non-intervention group were hospitalised. ○ There were no differences in rehospitalisation, emergency re-attendance, institutionalisation or mortality. ○ The non-intervention group had higher rates of progression to a poorer frailty category at all time points in the study. • **Conclusion**: Early geriatric specialist interventions in emergency can reduce potentially avoidable acute admissions and possibly benefit in attenuating frailty progression.
A report on an acute, in-hours, outpatient review clinic with ultrasonography facilities for the early evaluation of general surgical patients[2] Pidgeon, et al. 2016	• **Study type**: Retrospective, observational cohort study from the United Kingdom. • **Methods**: ○ **Aim**: An acute surgical clinic already in place allowed general surgical patients to be discharged home after their emergency department review, then attend the clinic for prompt follow up without the need for admission. ○ **Participants**: 490 patients presenting to emergency for general surgery concerns. ○ **Intervention**: The acute surgical clinic obtained ultrasonography capability. ○ **Comparison**: The acute surgical clinic before ultrasonography was available. • **Results**: ○ Following intervention, there was a reduction in the proportion of patients admitted to hospital from the clinic (p=0.002). ○ The proportion of patients undergoing computed tomography (CT) scans also fell (p<0.001). ○ The proportion of patients discharged after review was comparable for both clinic models. • **Conclusion**: An outpatient acute surgical review clinic with ultrasonography can reduce the need for unnecessary inpatient admissions and CT scans, in patients referred from emergency.
Implementing a guideline for acute tonsillitis using an ambulatory medical unit[4] Perkins, et al. 2019	• **Study type**: A retrospective, observational cohort study from the United Kingdom. • **Methods**: ○ **Participants**: 41 patients presenting to emergency with acute tonsilitis.

	○ **Intervention**: Management of patients in an ambulatory medical unit using a new acute tonsilitis guideline. ○ **Comparison**: Usual care. • **Results**: ○ The rate of overnight admission following implementation fell from 75% to 29%. ○ Average length of stay dropped from 19.2 to 9.5 hours following implementation. ○ A non-significant increase in readmissions occurred. • **Conclusion**: An ambulatory tonsillitis guideline and clinic significantly reduced admissions and length of stay. Readmissions remained low, demonstrating that this was a safe and cost-effective intervention.
The impact of an emergency care access point on pediatric attendances at the emergency department: An observational study[53] Platter, et al. 2020	• **Study type**: A retrospective, observational cohort study from the Netherlands. • **Methods**: ○ **Aim**: A paediatric emergency care access point was developed as a collaboration between general practitioners and an emergency department to reduce non-urgent emergency visits. ○ **Participants**: 3997 paediatric patients presenting to emergency. ○ **Intervention**: The emergency care access point consists of a triage point for after-hours emergency care, where staff determine whether the patient is seen by a general practitioner or referred to emergency. ○ **Comparison**: Usual care via emergency department. • **Results**: ○ Implementation was associated with a 16.3% reduction in paediatric emergency visits and 97.2% decline in self-referrals. ○ Consultations and follow up were required more frequently following implementation. ○ The overnight admission rate increased (49.3% versus 64.0%). • **Conclusion**: The implementation of an emergency care access point was associated with a reduction of paediatric emergency use. A primary care intervention might help reduce the workload in a paediatric emergency department.

Is the outpatient management of acute diverticulitis safe and effective? A systematic review and meta-analysis[9]
 	
Cirocchi, et al. 2019
	• **Study type**: Systematic review.
	• **Methods**:
	  ○ **Aim**: To assess the safety and efficacy of the management of acute diverticulitis in an outpatient setting.
	  ○ **Inclusion**: All control and observational studies which included patients who had outpatient management for uncomplicated colonic diverticulitis. Comparative studies were included if they focused on emergency hospitalisation versus no hospitalisation in patients with acute colonic diverticulitis.
	  ○ **Exclusion**: Studies in which the clinical evaluation after hospital discharge was not reported.
	  ○ **Dates searched**: Up to September 2018.
	• **Results**:
	  ○ The meta-analysis showed that outpatient management is safe, and the overall failure rate in an outpatient setting was 4.3%.
	  ○ A subgroup analyses did not report any factors that predicted the rate of failure.
	• **Conclusion**: The outpatient management of acute diverticulitis can reduce the rate of emergency hospitalisations.

Home treatment for acute mental healthcare: randomised controlled trial[23]
 	
Stulz, et al. 2019
	• **Study type**: Randomised control trial from Switzerland.
	• **Methods**:
	  ○ **Aim**: To test whether and to what degree home treatment services would enable a reduction of hospital use.
	  ○ **Participants**: 707 adult patients with a broad spectrum of mental disorders, experiencing crises that necessitated immediate admission to hospital.
	  ○ **Intervention**: Mobile and multidisciplinary home treatment team who provided acute outreach mental health care 24 hours a day and 7 days a week.
	  ○ **Comparison**: Usual care involving emergency admission and inpatient management.
	• **Results**:
	  ○ The mean number of hospital admission days per patient within 24 months after the original crisis was reduced by 30.4% ($p<0.001$) for the intervention group.
	  ○ No differences in average overall treatment duration (hospital days and home treatment days) or mean

	number of hospital admissions per patient within 24 months after the index crisis. ○ No significant between-group differences regarding clinical and social outcomes or patient satisfaction with care. • **Conclusion**: Home treatment services can reduce hospital use among severely ill patients in acute crises and seem to result in comparable clinical and social outcomes and patient satisfaction as standard inpatient care.
Outpatient versus inpatient treatment for acute pulmonary embolism [12] Yoo, et al. 2022	• **Study type**: Cochrane systematic review. • **Methods**: ○ **Aim**: To compare the efficacy and safety of outpatient versus inpatient treatment in low-risk patients with acute pulmonary embolism. ○ **Inclusions**: Randomised controlled trials of outpatient versus inpatient treatment of adults diagnosed with low-risk acute pulmonary embolism. ○ **Exclusions**: Studies which were not randomised controlled trials. ○ **Search dates**: Up to May 2021. • **Results**: ○ There were no clear differences in short-term mortality, long-term mortality, major bleeding at 14 days or 90 days, minor bleeding, recurrent pulmonary embolism within 90 days or participant satisfaction. • **Conclusion**: Currently, only low-quality evidence is available from two published randomised controlled trials. The studies did not provide evidence of any clear difference in outcomes.
Acute Crisis Care for Patients with Mental Health Crises: Initial Assessment of an Innovative Prehospital Alternative Destination Program in North Carolina[24] Creed, et al. 2018	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**: ○ **Participants**: 226 patients presenting with mental health crisis. ○ **Intervention**: Management at a community mental health clinic. ○ **Comparison**: Usual care via emergency department. • **Results**: ○ Patients were successfully triaged to be admitted to local facilities, external psychiatric facilities, were stabilised and discharged home, or transferred to emergency.

	○ Length of stay times were significantly shorter in the intervention group. • **Conclusion**: A dedicated community mental health centre is able to treat patients experiencing acute mental health crises and results in reduced length of stay.
A 'hot clinic' for cold limbs: the benefit of urgent clinics for patients with critical limb ischaemia[5] Khan, et al. 2020	• **Study type**: Prospective, observational cohort study from the United Kingdom. • **Methods**: ○ **Aim**: A critical limb ischaemia hot clinic was implemented to facilitate timely review and intervention and avoid admission. ○ **Participants**: 147 patients presenting with critical limb ischaemia. ○ **Intervention**: Patients managed in the hot clinic. ○ **Comparison**: Usual care via emergency department. • **Results**: ○ The median length of stay for the clinic cohort was shorter (3 days versus 17 days, p<0.001). ○ No differences between groups in time to procedure, return to theatre or 30-day readmission. ○ Clinic patients were nearly six times more likely to experience freedom from reintervention (p<0.001) and two and a half times less likely to undergo amputation (p=0.043). ○ Clinic use saved a total of 441 bed days. ○ Over 90% of attendees responded with 100% positive feedback. • **Conclusion**: A vascular hot clinic facilitates urgent review and revascularisation. It provides comparable in-hospital outcomes and better long-term outcomes, with greater efficiency than hospital admission.
Extended-hours palliative care service with a hospital-avoidance and enhanced-care approach: report of a quality improvement project[21] Keall, et al. 2020	• **Study type**: Retrospective, observational cohort study from Australia. • **Methods**: ○ **Aim**: A pilot of an extended hours community palliative care service. ○ **Participants**: Patients experiencing palliative care crises. ○ **Intervention**: An extended hours community palliative care service.

	○ **Comparison**: Usual care without the out of hours service. • **Results**: ○ An almost 50% decrease in acute hospitalisation. ○ After-hours palliative care unit admissions nearly doubled. ○ A 17% increase in patients staying in their home. • **Conclusion**: An extended hours community palliative care service can positively impact on reducing avoidable hospitalisations and facilitate palliative care patients to be in their preferred place of care.
Can a partnership between general practitioners and ambulance services reduce conveyance to emergency care?[22] Villarreal, et al. 2017	• **Study type**: A retrospective, observational cohort study from the United Kingdom. • **Methods**: ○ **Participants**: 1903 patients assessed by emergency services. ○ **Intervention**: Triage supported by a general practitioner (either at the scene or over the telephone). ○ **Comparison**: Triage conducted solely by emergency services. • **Results**: ○ 78% of patients who received general practitioner support were not transported to hospital. ○ Patients who received general practitioner telephone input were more likely to be transferred to emergency compared to those receiving face-to-face general practitioner assessment. • **Conclusion**: General practitioner support of paramedic services enabled patients to avoid transfer to emergency, particularly when patients were seen face to face by a general practitioner.
Rapid response: a multiprofessional approach to hospital at home[19] Dowell, et al. 2018	• **Study type**: Retrospective observational study from the United Kingdom. • **Methods**: ○ **Participants**: 251 adult patients with acute illness or requiring support in order to avoid hospital admission. ○ **Intervention**: The rapid response service provides specialist, coordinated, comprehensive and supportive assessment and treatment 24 hours a day in the patient's own home. Staff consists of nurses, specialist paramedics and physiotherapists. There are seven

	pathways within the service: cellulitis, chronic obstructive pulmonary diseases; falls; intravenous therapy; palliative; unwell adult; and urinary tract infection. ○ **Comparison**: Historical data on length of stay and costs associated with usual care via emergency and inpatient admission. • **Results**: ○ Length of contact is 2.7 days in the intervention versus 6.9 days for the equivalent condition as an inpatient. ○ Cost savings achieved by not transferring the patient to hospital and the reduction in length of stay represents a saving of £1,782. ○ The cost saving ratio is further enhanced when analysing the over-75 age group. ○ Overall patient and relative satisfaction with the service was high. • **Conclusion**: The cost savings and reduction in length of hospital stay associated with the rapid response team is considerable (to almost a quarter of the cost and number of bed days of an acute hospital admission).
Does Hospital Admission/Observation for Chest Pain Improve Patient Outcomes after Emergency Department Evaluation for Suspected Acute Coronary Syndrome?[7] Sharp, et al. 2022	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**: ○ **Participants**: 77,652 patients presenting to emergency with chest pain, in whom an acute myocardial infarction was not subsequently diagnosed. ○ **Intervention**: Discharge home with outpatient follow up arranged. ○ **Comparison**: Admission for monitoring (usual practice). • **Results**: ○ Between the two groups there were no differences in 30-day patient outcomes or likelihood of coronary revascularisation. • **Conclusion**: Among emergency patients with chest pain not diagnosed with an acute myocardial infarction, risk of major adverse cardiac events is quite low, and there does not appear to be any benefit in 30-day outcomes for those admitted or observed in the hospital compared to those discharged with outpatient follow-up.
Reducing Emergency Department Transfers from	• **Study type**: Retrospective, observational cohort study from the United States.

Skilled Nursing Facilities Through an Emergency Physician Telemedicine Service[26]
 	
Joseph, et al. 2020
	• **Methods**:
	  ○ **Participants**: 4,606 patients in a skilled nursing facility, requiring emergency physician review.
	  ○ **Intervention**: Virtual care appointment with an emergency care physician.
	  ○ **Comparison**: Usual care at nursing homes that did not have virtual care capability (transfer to emergency department).
	• **Results**:
	  ○ Patients who received the virtual care-based assessment were less likely to be admitted to the hospital (27%), compared to patients who were transferred to the emergency department for assessment (71%).
	• **Conclusion**: Providing virtual care by emergency physicians could decrease costs associated with hospital-based care and risks associated with hospitalisation.

The Development of a Standardized Pathway for Outpatient Ambulatory Fracture Surgery[3]
 	
Wolfstadt, et al. 2020
	• **Study type**: Retrospective, observational cohort study from Canada.
	• **Methods**:
	  ○ **Participants**: Healthy patients awaiting surgical treatment of a fracture.
	  ○ **Intervention**: Outpatient fracture management. The main interventions were a policy change to allow booking of outpatient urgent-room cases, education for patients and nurses, and the development of a standardised outpatient pathway.
	  ○ **Comparison**: Usual care, awaiting surgery as an inpatient.
	• **Results**:
	  ○ The percentage of patients managed as outpatients increased from 1.6% pre-intervention to 89.1% post-intervention.
	  ○ Length of stay was reduced from 2.8 to 0.2 days, a decrease of 94.0%.
	  ○ Patient satisfaction remained high, and there were no safety concerns while patients waited at home for the surgical procedure.
	• **Conclusion**: The outpatient fracture pathway vastly improved the efficiency and timeliness of care and reduced healthcare costs.

An ED pilot intervention to facilitate outpatient acute care for cancer patients[55]
 	
Brooks, et al. 2016
	• **Study type**: Retrospective, observational cohort study from the United States.
	• **Methods**:
	  ○ **Participants**: 808 patients with solid cancers presenting to emergency.
	  ○ **Intervention**: An oncologist embedded in an emergency department to review incoming patients.
	  ○ **Comparison**: Usual care in emergency.
	• **Results**:
	  ○ The proportion of emergency visits leading to hospitalisation was 70% versus 69% in the preintervention and intervention periods (p=0.62).
	  ○ There were no differences between groups in length of stay or subsequent use of acute care.
	• **Conclusion**: Embedding an oncologist in the emergency department of an academic medical centre did not significantly reduce hospital admissions.

Is Outpatient Management of Mandibular Fractures Associated With Inflammatory Complications? An ACS-NSQIP Study[10]
 	
Lee, et al. 2021
	• **Study type**: Retrospective, observational cohort study from the United States.
	• **Methods**:
	  ○ **Participants**: 1,848 patients with mandibular fractures.
	  ○ **Intervention**: Fracture management as an outpatient.
	  ○ **Comparison**: Usual care (inpatient fracture management).
	• **Results**:
	  ○ There was no significant difference in post-operative infections between patients treated as outpatients versus inpatients.
	  ○ Subjects treated as inpatients were 1.51 times more likely to experience any complication (p=0.008) due to an increase in non post-operative infection-related complications (p=0.028), in particular urinary tract infections (p=0.035).
	  ○ Outpatients had a shorter length of hospital stay.
	• **Conclusion**: Treating mandibular fractures in outpatient settings was effective and associated with decreased length of stay.

Hospital-Level Care at Home for Acutely Ill Adults: a Randomized Controlled Trial[31]	• **Study type**: Randomised control trial from the United States. • **Methods**:

Levine, et al. 2020	○ **Participants**: 91 adults admitted via the emergency department with any infection or exacerbation of heart failure, chronic obstructive pulmonary disease, or asthma. ○ **Intervention**: Acute care at home, including nurse and physician home visits; intravenous medications; remote monitoring; video communication and point-of-care testing. ○ **Comparison**: Usual care, patients presenting to emergency. • **Results**: ○ The adjusted mean cost of the acute care episode was 38% lower for home patients than control patients. ○ Compared with usual care patients, home patients had fewer laboratory orders, imaging studies and consultations. ○ Home patients spent a smaller proportion of the day sedentary or lying down. ○ Home patients were readmitted less frequently within 30 days. • **Conclusion**: Home hospitalisation reduced cost, healthcare use and readmissions, while increasing physical activity compared with usual hospital care.
Inpatient Versus Outpatient Acute Venous Thromboembolism Management: Trends and Postacute Healthcare Utilization From 2011 to 2018[8] Lutsey, et al. 2021	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**: ○ **Participants**: 200,346 patients with venous thromboembolism (which included pulmonary embolism and deep vein thrombosis). ○ **Intervention**: Acute outpatient management of venous thromboembolism. ○ **Comparison**: Usual inpatient care. • **Results**: ○ Healthcare utilisation in the six months following the incident was generally lower among patients managed as outpatients, regardless of initial presentation. ○ Outpatient management was associated with lower hazard ratios of incident bleeding risk. • **Conclusion**: Outpatient management of venous thromboembolism was associated with lower subsequent healthcare utilisation and fewer bleeding events. However, this

	may be because healthier patients were managed on an outpatient basis.

Translation of the geriatric emergency department intervention into other emergency departments: a post implementation evaluation of outcomes for older adults[52]
 	
Marsden, et al. 2022
	• **Study type**: Retrospective, observational cohort study from the United States.
	• **Methods**:
	  ○ **Participants**: Patients aged 70 years and older after presentation to emergency, considered most at risk of experiencing poor healthcare outcomes. This included patients presenting from residential aged care facilities, high functioning older adults who might have suffered incapacitating fractures (such as neck of femur), or those identified as carers for a highly dependent person.
	  ○ **Intervention**: Specialist geriatric nurses are placed in emergency to assist in the management of at-risk older patients, together with the usual emergency nursing and physician team.
	  ○ **Comparison**: Usual care in emergency.
	• **Results**: Patients in the intervention group demonstrated:
	  ○ increased likelihood of discharge
	  ○ decreased emergency department length of stay
	  ○ decreased hospital costs for those who were subsequently admitted
	  ○ an associated reduction in risk of mortality, for adults aged 70 years and over.
	• **Conclusion**: A geriatric emergency department initiative led to improved healthcare outcomes for older adults requiring acute care, including increased likelihood of discharge home from emergency.

Admission rates in a general practitioner-based versus a hospital specialist based, hospital-at-home model: ACCESS, an open-labelled randomised clinical trial of effectiveness.[18]
 	
Mogensen, et al. 2018.
	• **Study type**: Randomised clinical trial from Denmark.
	• **Methods**:
	  ○ **Participants**: 131 patients 65 years or older, with an acute medical condition that required acute hospital inpatient care.
	  ○ **Intervention**: general practitioner-managed hospital at home model.
	  ○ **Comparison**: Hospital physician-managed hospital at home model.
	• **Results**:

	○ 45% in the hospital physician arm versus 24% in the general practitioner arm were admitted within seven days (p=0.01), which remained significant at 30 days. ○ No differences were found in death or changes in performance tests from zero to seven days between the two groups. • **Conclusion**: The general practitioner-based model was more effective than the hospital physician model in avoiding hospital admissions within seven days among elderly patients with an acute medical condition with no differences in mental or physical recovery rates or deaths between the two models.
Hospital-at-home Integrated Care Programme for the management of disabling health crises in older patients: comparison with bed-based Intermediate Care[20] Mas, et al. 2017.	• **Study type**: Quasi-experimental longitudinal study from Spain. • **Methods**: ○ **Participants**: Older patients aged 80-85, with medical and orthopaedic disabling health crises in need of a comprehensive geriatric assessment and rehabilitation. ○ **Criteria**: Hospital at home required having a 24-hour caregiver with enough physical and cognitive capacity to assure healthcare at home. ○ **Intervention**: A hospital at home integrated care program (acute care and rehabilitation). ▪ Assignment to the intervention or control group was not randomised, but based on the availability of resources, on carer availability and on patient acceptance. ▪ Hospital at home staff included a geriatrician, two geriatric nurses, a physical medicine and rehabilitation specialist, four physiotherapists and a part time occupational therapist from community services. ○ **Comparison**: Usual inpatient hospital care (acute care plus inpatient intermediate care). • **Results**: ○ Acute stay was shorter in the home group (p<0.001). ○ The home-based scheme showed better results on functional outcomes and had shorter length of intervention, with a reduction of 5.72 days. • **Conclusion**: An extended hospital at home program, integrating principles of comprehensive geriatric assessment, was associated with shorter stay and favourable clinical outcomes compared to managing patients in hospital beds.

24-hour access outpatient clinic for patients with exacerbation of chronic disease: a before-after cohort study of differences in acute healthcare utilisation.[6]
 	
Møller, et al. 2018
	• **Study type**: Retrospective, observational cohort study from Denmark.
	• **Methods**:
	  ○ **Participants**: Patients with acute exacerbation of four selected chronic diseases: chronic obstructive pulmonary disease, chronic liver disease, inflammatory bowel disease and heart failure.
	  ○ **Intervention**: A 24 hour access outpatient clinic offering telephone support and triaged access to the hospital.
	  ○ The specialised triage nurses would first attempt solutions in the patient's immediate environment (e.g. community nurse services or general practitioner), or refer the patient for immediate assessment first in an outpatient setting at the hospital, as required.
	  ○ **Comparison**: Usual care for patients experiencing acute flare-ups (that is emergency department care).
	• **Results**:
	  ○ Length of stay remained unchanged for patients with chronic obstructive pulmonary disease, liver disease and inflammatory bowel disease.
	  ○ Length of stay for patients with heart failure was significant reduced.
	  ○ For higher risk patients, reductions in length of stay and acute admissions were observed for heart failure, inflammatory bowel disease and chronic obstructive pulmonary disease.
	  ○ A statistically significant reduction in the number of contacts to out-of-hours primary care was seen in patients with chronic obstructive pulmonary disease.
	• **Conclusion**: Introduction of a 24-hour access outpatient clinic was associated with significant reductions in hospital use for higher risk patients with chronic disease.

Direct Admission from the Emergency Department to a Subacute Care Ward: An Alternative to Acute Hospitalization[38]
 	
Ang et al. 2020
	• **Study type**: Observational cohort study from Singapore.
	• **Methods**:
	  ○ **Aim**: To evaluate admitting older patients from emergency departments directly to subacute care units.
	  ○ **Participants**: 194 elderly patients aged 65 years and over, under emergency department care.
	  ○ **Intervention**: A new protocol for transferring patients from emergency to a short-stay unit for stays of up to 24 hours.

	○ **Comparison**: Usual care in emergency followed by acute admission. • **Results**: The intervention group demonstrated: ○ reduced overall length of stay ○ reduced rate of hospitalisation ○ reduced number of patient transfers. • **Conclusion**: The protocol was effective in improving care continuity by reducing the number of patient transfers between care teams and associated risks.
Evaluation of the Cincinnati Veterans Affairs Medical Center Hospital-in-Home Program[33] Cai et al. 2018	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**: ○ **Aim**: To examine hospital readmissions, costs, mortality, and nursing home admissions of veterans who received hospital at home services. ○ **Participants**: 832 veterans with multiple conditions. ○ **Interventions**: Hospital equivalent care, provided at home. ○ **Comparison**: Usual acute care. • **Results**: ○ Average per person costs were $7,792 for the intervention versus $10,960 for inpatient care. ○ Thirty-day readmission rates and mortality were not statistically different between groups. • **Conclusion**: Hospital at home acute services in veterans' homes were lower cost and associated with lower likelihood of nursing home use after discharge.
Adjacent Primary Care May Reduce Less Urgent Pediatric Emergency Department Visits[11] Ellbrant et al. 2020	• **Study type**: Retrospective, observational study from Sweden. • **Methods**: ○ **Aim**: This study was designed to evaluate if a hospital-integrated primary care unit reduced less urgent visits at a paediatric emergency department. ○ **Participants**: All patients, up to 17 years, visiting the paediatric emergency department. ○ **Intervention**: Patients managed by the hospital-integrated primary care unit. ○ **Comparison**: Paediatric emergency visits prior to the intervention implementation. • **Results**: The intervention was associated with lower:

	○ proportions of emergency visits (p<0.001) ○ visits in the lowest triage group (p<0.001) ○ patients presenting with fever (p=0.001) or ear pain (p<0.001) ○ non-admitted emergency patients (p=0.033) ○ the proportion of infants three months old or less was higher in the intervention. • **Conclusion**: The implementation of a hospital-integrated primary care unit outside office hours and close to a large urban paediatric emergency department was associated with more efficient management of less urgent paediatric patients at more adequate levels of medical care.
Outcomes of Victorian Prevention and Recovery Care Services: A matched pairs comparison[57] Farhall et al. 2021	• **Study type**: Observational, matched pair comparative study from Australia. • **Methods**: ○ **Aim**: To evaluate the Prevention and Recovery Care Service for service use and costs. ○ **Participants**: 621 patients with acute mental health episodes. ○ **Intervention**: The Prevention and Recovery Care Service was a short-term residential mental health care service in the community, as a partial alternative to inpatient admissions. ○ **Comparison**: Patients managed as inpatients. • **Results**: Patients in the intervention group: ○ made less subsequent use of inpatient services ○ incurred costs similar to or lower than the inpatient group ○ were less likely to spend time on an involuntary treatment order following care ○ experienced positive clinical outcomes over the course of their admission, although magnitude of this improvement was not as great as for inpatient-only patients. • **Conclusion**: A short-term residential mental health care service in the community can provide an alternative and less restrictive care option for patients with acute mental health episodes and is associated with less subsequent use of acute inpatient services.
Reducing time in acute hospitals: A stepped-wedge randomised control trial of a specialist palliative care	• **Study type**: Randomised controlled trial from Australia. • **Methods**: ○ **Aim**: To determine whether a model of care, Specialist Palliative Care Needs Rounds, providing specialist

intervention in residential care homes[27] Forbat et al. 2020	palliative care in care homes could reduce length of stay in hospital. ○ **Participants**: 1,700 residents from Australian care homes, who had high symptom burden or were at risk of dying without a palliative care plan in place. ○ **Intervention**: Community-based service which consisted of 'needs rounds' (monthly meetings to discuss at-risk residents) and clinical work. Discussion of residents at needs rounds frequently led to initiating case conferences, completion of advance care planning with resident input, management of current and anticipatory medicines, and identifying legally appointed alternate decision makers. ○ **Comparison**: Usual care, which consisted of the specialist palliative care clinicians providing ad hoc reactive clinical consultations when referred to by facility staff. • **Results**: The intervention led to: ○ reduced length of stay in hospital (when admissions were required) by 31%, from 39 to 27 days ○ clinically significant reduction in the number of hospitalisations by 23% ○ estimated annual net cost saving of AUD$1,759,011 due to reduced admissions. • **Conclusion**: A proactive palliative model of care led to fewer residents using acute care services, in older people approaching end of life and living in care homes.
Integration of Inpatient and Residential Care In-Reach Service Model and Hospital Resource Utilization: A Retrospective Audit[28] Kwa, et al. 2021.	• **Study type**: Retrospective, observational cohort study from Australia. • **Methods**: ○ **Aim**: To evaluate a new type of in-reach service to treat acute health conditions not able to be managed by primary care, while still remaining in their place of residence. ○ **Participants**: Acutely unwell residential aged care residents. ○ **Intervention**: Nurse and geriatrician-led service which also incorporated an inpatient liaison nurse consultant. ○ **Comparison**: Prior model of care involving nurse and emergency physician-led care. • **Results**: The intervention was associated with:

	○ fewer unplanned emergency presentations (p<0.03) ○ fewer 28-day re-presentations (p<0.01) ○ lower emergency and inpatient admission costs. • **Conclusion**: Following implementation of the new model of care, a decrease in emergency presentations was observed along with associated reduced costs.
Pilot cluster randomised trial of an evidence-based intervention to reduce avoidable hospital admissions in nursing home residents (Better Health in Residents of Care Homes with Nursing—BHiRCH-NH Study) [17] Sampson, et al. 2020.	• **Study type**: Pilot cluster randomised controlled trial from the United Kingdom. • **Methods**: ○ **Aim**: To pilot a complex intervention to support healthcare and improve early detection and treatment for common health conditions experienced by nursing home residents. ○ **Participants**: 245 nursing home residents. ○ **Intervention**: Complex intervention to support healthcare and improve early detection and treatment of urinary tract and respiratory infections, chronic heart failure and dehydration, comprising: ▪ *Stop and Watch* early warning tool for changes in physical health ▪ a condition-specific care pathway ▪ a *Situation, Background, Assessment and Recommendation* tool to enhance communication with primary care. ○ **Comparison**: Usual care for nursing home residents as per existing local policy and practice. • **Results**: ○ There were no differences in the serious adverse events between groups. ○ The implementation strategy was not effective and nursing home staff did not engage with or use the intervention tools. ○ The outcome for avoidable hospitalisation could not be assessed due to incomplete and inconsistent recording. • **Conclusion**: Due to the intervention not being implemented as planned, a conclusion on expected outcomes cannot be drawn.
Impact of an Emergency Department-to-Home Transitional Care Intervention on Health	• **Study type**: Convergent, parallel, mixed-methods design including a randomised controlled trial from the United States. • **Methods**:

Service Use in Medicare Beneficiaries: A Mixed Methods Study[30] Schumacher, et al. 2021	○ **Aim**: To test the hypothesis that an emergency to home transitional care intervention reduces hospital-based acute care in chronically ill, older patients. ○ **Participants**: 1,101 medicare fee-for-service patients with chronic illness presenting to emergency. ○ **Intervention**: Care Transition Intervention® for the emergency to home intervention. ▪ If possible, trained Area Agency on Aging coaches visited patient participants in the emergency or called them within 24 hours of emergency discharge to introduce themselves, answer program questions, and schedule a home visit. ▪ During the home visit, coaches discussed the follow-up doctor visits, disease warning signs, medication reconciliation and personal health record. ○ **Comparison**: Usual post-emergency care. • **Results**: ○ No difference in the likelihood of hospital-based acute care between intervention and control group. ○ No difference in the likelihood of hospital admission. ○ No difference in the likelihood of outpatient visit within 60 days of index emergency visit. ○ In those with return emergency visits, the intervention group was less likely to be hospitalised than the usual care group. • **Conclusion**: Reducing hospital-based acute care requires increased holistic focus on the healthcare system rather than patients' care-seeking decisions.
Is Comprehensive Geriatric Assessment Admission Avoidance Hospital at Home an Alternative to Hospital Admission for Older Persons? : A Randomized Trial[32] Shepperd, et al. 2021	• **Study type**: Multisite randomised trial from the United Kingdom. • **Methods**: ○ **Aim**: To assess the clinical effectiveness of admission avoidance hospital at home with comprehensive geriatric assessment for older persons. ○ **Participants**: 1,055 older persons who were medically unwell, physiologically stable, and were referred for a hospital admission. ○ **Intervention**: Admission avoidance hospital at home with comprehensive geriatric assessment:

	▪ equivalent to bed-based hospital care for older people with frailty who are medically unwell and physiologically stable ▪ is a rapid response service that assesses a patient within one to two hours of referral and is provided for a limited time ▪ geriatrician-led admission ▪ multidisciplinary team ▪ healthcare guided by the principles of comprehensive geriatric assessment, that includes virtual rounds ▪ direct access to acute, hospital-based healthcare, such as diagnostics and transfer to hospital. ○ **Comparison**: Usual hospital admission. • **Results**: At six-month follow up, compared to the control group, the intervention group had: ○ no difference in the rates of living at home (75.3% versus 78.6%) ○ no difference in the rates of death (17.7% versus 16.9%) ○ no difference in the rates of being in long-term residential care (8.7% versus 5.7%). • **Conclusion**: Admission avoidance hospital at home with comprehensive geriatric assessment led to similar outcomes as hospital admission in the proportion of older persons living at home, as well as a decrease in admissions to long-term residential care at six months.
Interdepartmental program to improve outcomes for acute heart failure patients seen in the emergency department[13] Stiell, et al. 2021	• **Study type**: Prospective, observational cohort study from Canada. • **Methods**: ○ **Aim**: To evaluate the impact of rapid-access specialty clinics that saw acute heart failure patients discharged from emergency within seven days. ○ **Participants**: Patients aged 50 years or over who presented with shortness of breath (of less than seven days duration) due to acute heart failure. ○ **Intervention**: A rapid-access acute heart failure clinic staffed by the cardiology and internal medicine departments. ○ **Comparison**: Usual care in the pre-implementation period. • **Results**:

	○ Increased attendance at a specialty clinic (p<0.01). ○ Decreased number of days waiting for the clinic (from 13 to 6 days, p<0.01). ○ No overall decrease in hospital admissions. • **Conclusion**: A rapid-access approach to specialist appointments can improve access to care for acute heart failure patients discharged home from emergency, but does not decrease readmission rates.
Reinventing the community hospital: a retrospective population-based cohort study of a natural experiment using register data[46] Swanson and Hagen, 2016	• **Study type**: Retrospective, observational cohort study from Norway. • **Methods**: ○ **Aim**: To investigate whether implementation of municipal acute bed units was associated with reductions in hospital admissions, particularly for the elderly. ○ **Participants**: Patients requiring hospital care, excluding psychiatric admissions. ○ **Intervention**: Municipal acute bed units provide beds in local community hospitals, usually for either stable patients with a known acute primary diagnosis that can be evaluated and treated by primary care methods, or for patients whose treatment needs to be re-evaluated and adjusted. ○ **Comparison**: Usual care prior to municipal acute bed units, requiring acutely unwell patients who cannot be managed with outpatient primary care to present to an emergency department. • **Results**: ○ The introduction of municipal acute bed units was associated with a small yet significant overall reduction in number of hospital admissions. ○ The reduction in all admissions was significant for the entire population (−1.2%) and was slightly greater for those aged 80 years and above (−1.9%). • **Conclusion**: The introduction of municipal acute bed units was associated with a significant reduction in hospital admissions, primarily for the elderly.
Cost of home hospitalization versus inpatient hospitalization inclusive of a 30-day post-acute period[34] Saenger, et al. 2022	• **Study type**: Retrospective, observational cohort study from the United States. • **Methods**:

	○ **Aim**: To determine if combined acute and 30-day post-acute costs of care were lower for hospital at home patients compared to traditional inpatient care. ○ **Participants**: Eligible patients were 18 years or older, required inpatient admission, and met home safety requirements. ○ **Intervention**: Hospital-equivalent care, provided at home. ○ **Comparison**: Patients who did not receive the intervention or were admitted when the intervention was not available. • **Results**: ○ Hospital at home patients were older (p<0.0001) and more likely to have activities of daily living impairments (p<0.0001). ○ Unadjusted mean costs were $5,054 lower for hospital at home episodes compared to inpatient episodes. ○ Hospital at home costs were $5,116 lower (p=0.05), and when adjusted for age, sex, insurance, diagnosis and activities of daily living impairments, $5,977 lower (p=0.01). • **Conclusion**: A hospital at home intervention, combined with 30-day post-acute transition care, was less costly than usual inpatient care.

Table 2: **Quick diagnostic units**

Source	Summary
Peer reviewed sources	
Cost-minimization analysis favors outpatient quick diagnosis unit over hospitalization for the diagnosis of potentially serious diseases[35] Sanclemente-Ansó, et al. 2016	• **Study type**: An observational, retrospective cohort study from Spain. • **Methods**: ○ **Aim**: To evaluate the costs of a quick diagnostic unit versus conventional hospitalisation for the diagnosis of cancer and anaemia. ○ **Participants**: Patients who went on to receive a diagnosis of severe anaemia (unrelated to malignancy), lymphoma or lung cancer.

	○ **Intervention**: Patients referred to a quick diagnostic unit for medical investigations. ○ **Comparison**: Traditional model of admission to an inpatient unit for medical investigations. • **Results**: ○ Time to diagnosis in quick diagnostic unit patients (n=195) and length of stay in hospitalised patients (n=237) were equivalent. ○ There were considerable cost savings when the quick diagnostic unit model was adopted. • **Conclusion**: Quick diagnostic units appear to be a cost-effective resource for avoiding unnecessary hospitalisation in patients with anaemia and cancer.
What is the relevance of an ambulatory quick diagnosis unit or inpatient admission for the diagnosis of pancreatic cancer? A retrospective study of 1004 patients[61] Bosch, et al. 2020	• **Study type**: An observational, retrospective cohort study from Spain. • **Methods**: ○ **Participants**: 1,004 patients who were referred by primary care or emergency, who went on to receive a diagnosis of pancreatic cancer. ○ **Intervention**: Investigations leading to pancreatic cancer diagnosis in an ambulatory outpatient quick diagnostic unit. ○ **Comparison**: Traditional model of admission to an inpatient unit for medical investigations. • **Results**: ○ Diagnosis of pancreatic cancer is effective in both an inpatient and quick diagnostic unit setting. ○ There were no differences in the time to diagnosis between the two approaches. ○ The costs for inpatients were nearly the double those of quick diagnostic unit patients. • **Conclusion**: Diagnosis of pancreatic cancer is similarly achieved by conventional hospitalisation and a hospital-based ambulatory quick diagnostic unit. The latter approach appears to be cost-effective.

Table 3: **Observation units**

Source	Summary
Peer reviewed sources	

Effect of a Multi-Diagnosis Observation Unit on Emergency Department Length of Stay and Inpatient Admission Rate at Two Canadian Hospitals[37]
 	
Cheng, et al. 2016
	• **Study type**: An observational, retrospective cohort study from Canada.
	• **Methods**:
	  ○ **Aim**: This study aimed to determine whether an observation unit reduces length of stay and hospital admission rates for adults with a variety of presenting complaints.
	  ○ **Participants**: 109,625 patient visits of any nature to emergency departments at two hospitals.
	  ○ **Intervention**: All adults presenting to hospital during a six month period after implementation of an observation unit.
	  ○ **Comparison**: All adults presenting in the same six month period in the year before the observation unit implementation.
	• **Results**:
	  ○ The intervention was associated with an increase in the median length of stay at one hospital, and no change at the second hospital.
	  ○ The intervention was associated with decreased hospital admission rate for one hospital ($p<0.05$) but not the other.
	• **Conclusion**: This study did not replicate previous findings that having an observation unit reduces length of stay. A multi-diagnosis observation unit may, however, reduce hospital inpatient admission rates in a site-specific manner depending on the setting and context.

Opening of Psychiatric Observation Unit Eases Boarding Crisis[47]
 	
Parwani, et al. 2018
	• **Study type**: An observational, retrospective cohort study from the United States.
	• **Methods**:
	  ○ **Aim**: This study aimed to evaluate the effect of a psychiatric observation unit in reducing emergency department boarding (delays to admitted patients being physically transported to the wards) and length of stay for patients presenting with primary psychiatric chief complaints.
	  ○ **Participants**: 7,299 adult patients requiring evaluation by the acute psychiatry service in the crisis intervention unit.
	  ○ **Intervention**: Admission to a 12-bed psychiatric observation unit.

	○ **Comparison**: Patient flow prior to the psychiatric observation unit's creation (workup in emergency followed by potential hospital admission). • **Results**: The intervention was associated with significant reductions in: ○ median emergency length of stay (from 155 to 35 minutes, p<0.0001) ○ median overall length of stay (from 1,112 to 920 minutes, p<0.0001) ○ psychiatric hold rate (proportion of patients admitted for observation or inpatient hospitalisation; from 49.8% to 42%, p<0.0001) ○ inpatient psychiatric admission rate (from 42% to 25.4%, p<0.0001). • **Conclusion**: Following the introduction of a psychiatric observation unit, a greater proportion of patients were held for observation, however, this was completed in a dedicated psychiatric observation unit rather than in emergency, and led to overall reduced inpatient admissions and reduced length of stay.
Outcomes of an Emergency Department Observation Unit–Based Pathway for the Treatment of Uncomplicated Vaso-occlusive Events in Sickle Cell Disease[40] Lyon, et al. 2020	• **Study type**: An observational, prospective cohort study from the United States. • **Methods**: ○ **Participants**: Patients presenting to hospital with vaso-occlusive events due to sickle cell disease. ○ **Intervention**: Rapid transfer of the patient from triage to the observation unit together with a sickle cell treatment pathway. ○ **Comparison**: Treatment of patients in the emergency department or admitted as inpatients. • **Results**: ○ The pre-implementation hospital admission rate was 33%, 3-day return rate 16% and 30-day return rate 67%. ○ Refinements to the sickle cell pathway resulted in decreases to: admission rates to 20%, 3-day return rate to 3.6% and 30-day return rate to 41%. • **Conclusion**: The use of a sickle cell pathway for the treatment of uncomplicated vaso-occlusive events, which includes admission to an observation unit, was effective in providing rapid treatment and reducing hospital admissions.

Comparison of 1-Day Emergency Department Observation and Inpatient Ward for 1-Day Admissions in Syncope Patients[50]
 	
Grossman, et al. 2016
	• **Study type**: An observational, retrospective cohort study from the United States.
	• **Methods**:
	  ○ **Aim**: to determine differences in outcomes between one-day inpatient versus observation unit stays for syncope.
	  ○ **Participants**: 351 patients presenting to emergency with syncope.
	  ○ **Intervention**: Transfer to the observation unit for 24-hour investigations followed by discharge.
	  ○ **Comparison**: Usual care of 24-hour inpatient admission for investigations.
	• **Results**:
	  ○ Patients in the observation unit were more likely to have unknown causes of syncope at discharge (36%) when compared with inpatients (26%).
	  ○ Patients in the observation unit were more likely to be discharged without a diagnosis ($p \leq 0.05$).
	• **Conclusion**: Patients in the observation unit were less likely than patients admitted to the hospital to be discharged with an identified cause of their syncope.

Impact of an Emergency Department Observation Unit Management Algorithm for Atrial Fibrillation[41]
 	
Bellew, et al. 2016
	• **Study type**: An observational, retrospective cohort study from the United States.
	• **Methods**:
	  ○ **Aim**: to evaluate the impact of a management algorithm for atrial fibrillation, that included using an emergency department observation unit, on hospital admission rates and patient outcomes.
	  ○ **Participants**: 1,190 patients presenting to hospital with symptomatic atrial fibrillation.
	  ○ **Intervention**: Patients who presented after implementation of the algorithm and were managed in the observation unit.
	  ○ **Comparison**: Usual care (patients managed in emergency or via inpatient admission).
	• **Results**:
	  ○ The rate of inpatient admission was significantly lower in the intervention group (from 45% to 36%; $p<0.001$).
	  ○ The groups were not significantly different with regard to rates of return emergency department visits, hospitalisation, or adverse events within 30 days.

	○ Emergency department observation unit admissions were 40% (p<0.001) less costly than inpatient hospital admissions of less than one day's duration. • **Conclusion**: Implementation of an observation unit atrial fibrillation algorithm was associated with significantly decreased hospital admissions, without increasing the rates of return emergency department visits, hospitalisation, or adverse events within 30 days.
Can an Emergency Department Observation Unit Reduce Hospital Admissions for COPD Exacerbation?[42] Budde, et al. 2018	• **Study type**: An observational, retrospective cohort study from the United States. • **Methods**: ○ **Aim**: To evaluate the effect on admissions, following creation of a dedicated observation unit pathway for chronic obstructive pulmonary disease patients. ○ **Participants**: Patients presenting to emergency with acute exacerbation of chronic obstructive pulmonary disease. ○ **Intervention**: Patients managed on the observation unit via a dedicated chronic obstructive pulmonary disease pathway. ○ **Comparison**: Usual care via emergency and hospital admission, prior to the development of the chronic obstructive pulmonary disease pathway. • **Results**: ○ There was a 12.8% reduction in hospital admissions after the observation unit became available for management (p=0.0049). ○ There was no significant change in the proportion of patients discharged directly from emergency. • **Conclusion**: The availability of an observation unit can decrease hospital admissions for acute exacerbations of chronic obstructive pulmonary disease, while still ensuring these patients are appropriately managed.
Cost Savings and Efficacy in Management of Paracetamol Poisoning in a 23-hours Emergency Department Observation Unit: A Comparison to Inpatient Care[43] Kuan, et al. 2019	• **Study type**: An observational, retrospective cohort study from Singapore. • **Methods**: ○ **Aim**: To compare the costs and effectiveness of managing paracetamol overdose patients in an observation unit with those treated as inpatients. ○ **Participants**: 379 patients presenting to hospital for paracetamol overdose.

	○ **Intervention**: Patients managed in an observation unit. ○ **Comparison**: Patients managed in a general inpatient ward. • **Results**: ○ The two groups had similar treatments and adverse event profiles. ○ Length of stay was 31.9 hours shorter in the observation unit group compared to the inpatient ward group. ○ Observation unit patients have statistically significant savings of SG$784 per patient. • **Conclusion**: Observation units are a cost-effective and safe alternative for the management of selected paracetamol poisonings.
Performance of an emergency department observation unit protocol in reducing length of stay for acetaminophen overdose: a retrospective study[44] Tang, et al. 2018	• **Study type**: An observational, retrospective cohort study from Singapore. • **Methods**: ○ **Aim**: To compare the effectiveness of managing paracetamol-poisoned patients in an observation unit with those treated in the inpatient wards. ○ **Participants**: 117 patients presenting to hospital for paracetamol poisoning. ○ **Intervention**: Patients managed in an observation unit. ○ **Comparison**: Usual care in an inpatient ward. • **Results**: ○ Median length of stay for patients managed in the observation unit was 23 hours compared to 66 hours for those admitted to the ward. • **Conclusion**: This study demonstrates that the observation unit is an effective strategy in reducing the of length of stay for stable patients presenting with acute paracetamol poisoning.
Use of Physician-in-Triage Model in the Management of Abdominal Pain in an Emergency Department Observation Unit[45] Marshall, et al. 2017	• **Study type**: An observational, retrospective cohort study from the United States. • **Methods**: ○ **Aim**: to determine whether there is a significant difference in success rates and length of stay for two cohorts of patients presenting with abdominal pain. ○ **Participants**: 327 patients presenting to hospital with abdominal pain.

	○ **Intervention**: Patients managed in an observation unit under an abdominal pain protocol by a physician in triage (bypassing the main emergency department). ○ **Comparison**: Patients evaluated and treated in the main emergency department prior to observational unit admission. • **Results**: ○ There were no significant differences in success rates (discharge home within 24 hours) between the two groups. ○ Total length of stay was significantly shorter for the group who bypassed the main emergency department ($p<0.001$). • **Conclusion**: The data from this study support the implementation of an observational unit model which bypasses the emergency department, to improve efficiency in the treatment of abdominal pain.
Implementing a multidisciplinary rapid geriatric observation unit for non-critical older patients referred to hospital: observational study on real-world data[48] Nouvenne, et al. 2022	• **Study type**: Retrospective observational cohort study from Italy. • **Methods**: ○ **Aim**: To evaluate the outcomes for patients admitted to a geriatric observation unit. ○ **Participants**: 308 elderly patients admitted for medical investigations. ○ **Intervention**: Management in a geriatric observation unit. ○ **Comparison**: Management in regular inpatient wards. • **Results**: ○ Patients in the intervention group experienced a significantly lower overall duration of hospital stay (median three days) than controls (median five days, $p<0.001$), but similar hospital mortality. • **Conclusion**: Acute geriatric care on a dedicated observation unit is feasible, safe and has the potential of reducing unnecessary hospitalisations of older patients.
Creation of an Adult Observation Unit: Improving Outcomes[39] Plamann, et al. 2018	• **Study type**: Retrospective observational cohort study from the United States. • **Methods**:

	○ **Aim**: To determine if introducing an observation unit improved length of stay, patient costs and patient satisfaction. ○ **Participants**: Patients requiring short hospital stays for observation who were unlikely to require subsequent inpatient admission. ○ **Intervention**: Admission to an observation unit. ○ **Comparison**: Usual care in emergency and/or inpatient wards. • **Results**: ○ Average length of stay was reduced from 40 to 26.8 hours. ○ Direct costs were reduced by 10.4%. ○ Patients rated several areas as improved, including communication with physicians (68.8 to 100%) and willingness to recommend the unit (74 to 100%). ○ The communication with nurses score declined from 82.3% to 73.3% post-implementation, which authors planned to investigate further. ○ Patients managed in the observation unit left emergency 10 minutes faster than patients requiring observation destined for an inpatient unit, increasing throughput. ○ Fewer patients were diverted to other hospitals as the hospital had increased capacity. • **Conclusion**: The establishment of an adult observation unit was associated with a reduction in length of stay and direct costs as well as improvements in patient satisfaction scores.
Utility of a pediatric observation unit for the management of children admitted to the emergency department[49] Gatto et al. 2021	• **Study type**: Retrospective cohort study from Italy. • **Methods**: ○ **Participants**: Children presenting to the emergency department. ○ **Intervention**: Children admitted to the paediatric observational unit. ○ **Comparison**: Usual emergency-based care during the previous two years. • **Results**: The intervention was associated with reduced hospitalisations by 3.6% ($p<0.001$). • **Conclusions**: This study demonstrates that an observational unit is a valid alternative to ordinary care.

Appendix 1: Search terms and criteria

PubMed search terms

Outpatient management and **hospital at home**

((("inpatient"[Title/Abstract] AND "versus"[Title/Abstract]) OR (("hospital"[Title/Abstract] OR "inpatient"[Title/Abstract] OR "emergency department"[Title/Abstract]) AND ("admission"[Title/Abstract] OR "stay"[Title/Abstract]) AND ("avoid*"[Title/Abstract] OR "reduc*"[Title/Abstract]))) AND (("alternat*"[Title/Abstract] OR "outpatient"[Title/Abstract] OR "home"[Title/Abstract] OR "primary care"[Title/Abstract] OR "general practi*"[Title/Abstract] OR "hospital at home"[Title/Abstract]) AND ("admission"[Title/Abstract] OR "management"[Title/Abstract] OR "treatment"[Title/Abstract] OR "setting"[Title/Abstract] OR "model"[Title/Abstract] OR "service*"[Title/Abstract] OR "care"[Title/Abstract])) AND 2016/01/01:2022/12/31[Date - Publication] AND ("acute"[Title/Abstract] OR "urgent"[Title/Abstract])) AND ((humans[Filter]) AND (english[Filter]))

948 hits on 31 May 2022

Quick diagnostic unit

(("diagnostic unit*"[Title/Abstract] OR "diagnosis unit*"[Title/Abstract]) AND ("rapid"[Title/Abstract] OR "quick"[Title/Abstract])) AND (2010:2022[pdat])

52 hits on 31 May 2022

Observation unit

"observation"[Title] AND ("unit"[Title] OR "ward"[Title]) AND 2016/01/01:3000/12/31[Date - Publication]

130 hits on 31 May 2022

Inclusion and exclusion criteria

Inclusion	Exclusion
• Published since 2016 • **P**opulation: patients presenting with one or more acute medical conditions conventionally managed in an inpatient hospital unit • **I**ntervention: alternative models of care to acute or inpatient management • **C**omparator: conventional model of care • **O**utcome: efficacy or effectiveness of managing such a condition using an alternative management strategy that avoided hospital admission • **S**tudy design: systematic review studies, randomised or non-randomised clinical trials, observational studies with a comparison group	• Not in English or published prior to 2016 • Does not meet PICOS criteria

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