Hospital at Home

Guiding principles for service development – supporting appendices

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Acknowledgements

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Contents

About the supporting appendices

The information provided in these appendices is to support and provide further detail to: "Hospital at Home: Guiding Principles for Service Development" which is available at www.ihub.scot/hospital-at-home.

If you have any questions concerning the appendices please contact: info@ihub.scot

Appendix 1 - Healthcare Improvement Scotland's Review of published evidence on Hospital at Home, January 2020

Introduction

A literature review was undertaken to bring together the published evidence on the effectiveness and safety of Hospital at Home (HaH) initiatives for older people with frailty and to discover any lessons that can be learned on what works, for whom and why.

Key points from evidence review

- The evidence base for Hospital at Home interventions is characterised by heterogeneity. The range of patient populations encompassed, the specification of interventions, including the way in which services are accessed and the scope and intensity of healthcare professional input, vary widely.

- The most comprehensive and robust evidence available currently on the effectiveness of 'admission avoidance' Hospital at Home is a Cochrane systematic review, including a meta-analysis of randomised controlled trials (RCTs). This review found that admission avoidance HaH had similar rates of mortality (six trials, n=912) and re-admission (seven trials, n=834) when compared with inpatient care. Hospital at Home reduced the likelihood of living in residential care at up to six months follow up and may lead to greater patient satisfaction. Effect of HaH on length of stay varied. Rates of complications were lower or similar in the HaH group. Effects on medication use varied. In elderly patients there was evidence from three analyses that costs of care may be lower for HaH when compared with inpatient care.

- The findings of a large UK RCT (n=1055), expected to be published in early 2020, should add to this evidence base for decision making in NHSScotland by addressing some of the methodology issues identified in earlier trials, including a large number of patients and being specific to the UK setting.

- Meanwhile, one additional RCT published since the Cochrane review examined HaH in UK patients with exacerbations of COPD and at low risk of mortality. This trial found that, when compared with usual hospital care, HaH had similar clinical outcomes in terms of mortality and subsequent use of health services. Hospital at Home reduced length of stay. In addition, the majority of patients expressed a preference for HaH.

- There is very limited relevant evidence available on the cost effectiveness of Hospital at Home. One UK RCT, considering only individuals with COPD, found that a Hospital at Home service had a 90% chance of being cost effective (according to a commonly

adopted threshold of £30,000 per QALY). A retrospective analysis conducted using data from Scotland found considerable variation in costs and outcomes of three different HaH services in Scotland.

- Investigations into patient and staff experiences of Hospital at Home highlighted challenges for HaH services including pain management, trans-disciplinary working and mobile access to patient records.

- Two studies identified barriers and facilitators to the successful introduction and operation of a Hospital at Home service. These included policy and regulatory hurdles, and communication and co-ordination of workflow.

- Very little evidence was identified that considered the views of a patient's family, friends and informal caregivers on HaH.

Search strategy

A literature search was carried out between 8th and 14th October 2019. The following databases were searched: Cochrane Library, Medline, Embase, Cinahl and ASSIA. No restrictions were applied regarding study types or dates. Language was restricted to English.

A Cochrane review (Shepperd 2016[1]) identified two ongoing trials in searches up to March 2016. Two published papers were identified for one of these trials[2, 3]. The second trial is still ongoing. Reports outlining the protocols for this trial were included[4, 5]. An additional search was carried out for studies which cited a key systematic review (Caplan 2012[6]).

Concepts used in the searches included: "Hospital at Home", admission avoidance, and frail elderly. A full list of resources searched and terms used are available from Healthcare Improvement Scotland on request.

Varying terminology was used within the identified studies to describe the concept of Hospital at Home, but for the purpose of this review to inform NHSScotland, the intervention being considered had to conform to the following:

- A service that provides active treatment by healthcare professionals in the patient's own home (or care home) for a condition that otherwise would require acute hospital inpatient care, and always for a limited time.

- Providing care and treatment for acutely unwell people. It is specialist-led, with senior medical decision making. Referrals to HaH may come from the ambulance service or general practitioners, as well as from hospital emergency departments or acute assessment wards.

- Replacing hospital admission by providing acute care in the home context (including nursing and residential homes). It is distinct from community-led services to reduce unplanned hospital admissions or services to facilitate early hospital discharge.

Studies on Hospital at Home were identified which focused on interventions to support early discharge[7], or brought together studies where the intervention aims were to facilitate hospital admission avoidance and/or early hospital discharge for particular patient groups[8-10], which could comprise patients other than frail elderly. These were excluded as outside of definitions for this rapid review.

Research findings: effectiveness and safety

Existing secondary (syntheses of primary research studies) literature is considered first, focusing on the most recent and best quality evidence available to answer the questions of interest. Then randomised controlled trials (RCTs), as the most robust type of study to answer questions of effectiveness, which were published subsequently to the included RCTs within the systematic reviews, are examined to determine whether and how they add to the secondary evidence base. Ongoing RCTs are noted. Lastly non-randomised comparative studies are described. As with all such studies, the lack of a randomisation process to ensure comparable groups, limits the confidence which can be had in their findings. However such studies can be helpful in complementing the more robust evidence from RCTs, particularly when they consider additional outcomes, outcomes over the longer term or safety considerations.

Systematic reviews

One Cochrane systematic review was identified, which specifically focused on HaH for admission avoidance[1]. The review included studies in adults aged 18 years and over, so a broader population than of interest for the current suggested service development in Scotland. The primary outcomes were mortality and transfer (or re-admission) to hospital. Additional outcomes included place of residence at follow-up, length of stay, complications, functional ability, quality of life, patient satisfaction and cost. Literature searches were conducted in March 2016 and 16 randomised controlled trials were included in the review. Table 1 summarises characteristics of the included trials. There was variation across trials in the patient characteristics and healthcare setting. In the majority of trials patients were recruited to HaH from the emergency room and care was provided most often by either hospital outreach, or by a mix of community services and hospital outreach. Half of the trials excluded participants who did not have continuous family support. To limit heterogeneity, the meta-analyses for the mortality outcomes excluded trials recruiting participants with specific conditions. These conditions were community-acquired pneumonia, significant cognitive impairment, cellulitis, febrile neutropenia as a result of chemotherapy, and neuromuscular disease and respiratory infection.

There was no evidence of a difference in mortality at three months between patients experiencing HaH and those receiving inpatient care. At six months there was evidence consistent with the possibility of a small beneficial effect. Evidence for mortality was described as moderate-certainty.

- Mortality at three months follow-up was assessed based on individual patient data (IPD) meta-analysis from five studies (n=833). Following adjustment for age and sex, the risk ratio (RR) was 0.77 (95% confidence interval CI 0.54 to 1.09, p=0.15).

- Mortality at six months follow-up was based on published and unpublished data combining six trials (n=912). RR was 0.77 (95% CI 0.60 to 0.99, p=0.04).

Table 1: Cochrane systematic review of admission avoidance HaH[1]-characteristics of included studies

	n	Participants	Setting	Admission to HaH from	Care provided by
Davies 2000	150	COPD	UK	ED	Mix
Nicholson 2001	25	COPD	Australia	ED	Mix
Ricauda 2008 ⌂	104	COPD	Italy	ED	Hospital outreach
Kalra 2000	305	Stroke	UK	GP	Mix
Ricauda 2004 ⌂	120	Stroke	Italy	ED	Hospital outreach
Caplan 1999 ⌂	100	Acute medical	Australia	ED	Hospital outreach
Harris 2005	76	Acute medical	New Zealand	GP	Hospital outreach
Mendoza 2009 ⌂	71	Acute medical HF	Spain	ED	Hospital outreach
Tibaldi 2009 ⌂	101	Acute medical HF	Italy	ED	Hospital outreach
Wilson 1999	199	Acute medical	UK	GP	GP + nursing
*Corwin 2005	194	Cellulitis	New Zealand	ED	GP + nursing
*Richards 2005 ⌂	49	Pneumonia	New Zealand	ED	GP + nursing
*Talcott 2011	113	Fever/neutropenia	US	Outpatient	Hospital outreach
*Tibaldi 2004 ⌂	109	Dementia frailty	Italy	ED	Hospital outreach
*Vianello 2013 ⌂	53	NM + RTI	Italy	ED	Mix
*Andrei 2011~	45	Acute medical HF	Romania	ED	Unclear

*trials excluded from consideration for mortality outcome analysis, ~ abstract only
⌂ studies which excluded patients who did not have continuous family support
COPD - chronic obstructive pulmonary disease
HF - heart failure, RTI - respiratory tract infection, ED - emergency department, GP - general practitioner
NM – neuromuscular, Mix - combination of community based services and hospital outreach

When data from three published studies were analysed alongside additional unpublished data from four studies (n=834) there was no evidence of an effect of HaH on hospital re-admission or transfer for older patients (≥65 years) at an average of five months follow-up (RR = 0.98 95% CI 0.77 to 1.23, p=0.84). Follow-up periods included three, six and 12 months. Evidence was described as moderate-certainty for this outcome.

Based on five RCTs (n=727), HaH was found to reduce the likelihood of living in residential care/institutional setting measured at follow-up, which for three studies was the point of discharge, (RR= 0.35 95%CI 0.22 to 0.57, p<0.0001). The level of certainty of evidence was low due to high statistical heterogeneity (I^2=78%).

The effect of HaH on length of stay varied across the seven studies where this was an outcome measure. In a study of older people with varied health problems HaH reduced length of stay -8.09 days (95% CI -14.34 to -1.85) whilst in a study recruiting patients recovering from a stroke HaH increased length of stay 15.90 days (95% CI 8.10 to 23.70).

It was not possible to combine measures of functional ability in meta-analysis since a wide range of scales were used across the studies, and these were specific to the patient groups. For example: respiratory scores, neurological scores and measures of behaviour disturbance. Findings of the primary studies are described in the systematic review with information on the statistical significance of differences where it was available. In most cases there was no statistically significant difference between study arms. In a trial in patients with dementia there were statistically significant benefits for HaH on the proportion of patients experiencing sleeping disorders, feeding disorders and agitation/aggression.

The impact of HaH on quality of life/health status was measured in seven studies and was assessed at varying time intervals, from six days, or immediately after resolution of the health event, to one year. A range of instruments was used including the Short Form Health Survey (SF-36), Sickness Impact Profile and Nottingham Health Profile. Findings of the primary studies are described in the systematic review with information on the statistical significance of differences where it was available. Most studies reported no statistically significant difference between study arms. No overall conclusion was made on the impact of HaH on quality of life measures.

Five trials assessed patient satisfaction. A range of scales and questionnaires were used and response rates and timing of measurement varied. In two trials the instrument used was not specified. Overall, HaH patients expressed greater or similar satisfaction with care or location of care, although the quality of evidence for this outcome is low.

Three studies reported on the impact of HaH on informal carers. One study found that carers of patients in HaH had higher rates of satisfaction compared with those caring for patients admitted to hospital, but the response rate to the survey was low. Another study found no difference in relatives' stress levels at six months between the two interventions.

A qualitative interview study identified that the strain of extra caring work at home was balanced by the benefit of not having to do hospital visiting and having greater understanding of and involvement in decision making around care. Carers reported appreciating not having to be separated from loved ones. Interviews were conducted in the presence of the patients, which may have influenced the findings.

Three included trials reported on complications. One reported a reduction in the proportion of patients experiencing bowel complications (difference -22.5%, 95% CI -34% to -10.8%) or urinary complications (difference -14.4%, 95% CI -25.4% to -3.3%) with HaH. Two studies reported no difference between allocated study arms for progression of cellulitis (hazard ratio (HR) 0.98, 95%CI 0.73 to 1.32) and for rate of major complications during the care episode (difference 1%, 95% CI -10 to 13%).

In a trial in patients with dementia the proportion of patients prescribed antipsychotics was lower in the HaH group (difference -14%, 95%CI -28% to 0.3%). In one study patients with COPD were more likely to receive antibiotics if they were in the HaH group compared with inpatient care (difference 18%, 95% CI 1.4% to 34.6%).

Cost data relating to three studies where the participants were elderly patients with a health condition are outlined in table 2. For all three studies there was evidence of reduced costs in the HaH arm, although there was variation in which costs were included. The study by Mendoza attributed reduced costs to there being fewer tests and investigations undertaken in the group of patients receiving HaH. The Cochrane review authors concluded that with costs of informal care excluded, admission avoidance Hospital at Home may be less expensive than admission to an acute hospital ward.

Table 2: Cost outcomes for studies on elderly patients[1]

Wilson 1999	Cost minimisation analysis	Per protocol Difference in costs at 3 months £-1,063.45 (95% CI £-2,043.8 to £-162.7) HaH lower costs than control	Intention to treat Difference in costs at 3 months £-210.9 (95% CI £-1,025 to £635.5) No difference in costs
Caplan 1999	Cost Cost of nurse-coordinator and hospital doctor were excluded from the analysis	Cost of episode of care: Treatment group AU$1,764 (SD 1253) Control group AU$ 3,775 (SD 2496) Mean difference AU$ -2011 Cost per day: Treatment group AU$ 191 (SD 58) Control group AU$ 484 (SD 67.23) Mean difference AU$ -293	
Mendoza 2009	Cost	Mean (SD) Treatment group EURO 2,541 (1,334) Control group EURO 4,502 (2,153)	

		Difference EURO 1,961 p< 0.0001

A systematic review underlying the NICE guideline on service delivery and organisation of emergency and acute medical care in over-16s examined a subset of the studies in the Cochrane review focusing on admission avoidance HaH services led by secondary care[11]. There was no evidence of effect on mortality, four studies (n=329), RR 0.80 (95% CI 0.47 to 1.35). Re-admissions after 30 days were lower in the HaH group, three studies (n=252), RR 0.56 (95% CI 0.42 to 0.75). The guideline committee noted that the majority of the trials included in the admission avoidance analysis recruited elderly patients with medical events and that avoiding re-admission was likely to be particularly important for people with chronic conditions as, in this group, hospital admission might have a disproportionately adverse effect on psychological wellbeing and independence. There was increased length of stay in the HaH group compared with inpatient admission: 4.69 days (95% CI 2.86 to 6.52). This was based on two studies and described as low certainty of evidence due to inconsistency.

The NICE review also examined economic analyses of HaH led by secondary care[11]. Three studies relevant to older people were identified, and in each case HaH dominated (offered greater benefits for lower costs) inpatient care. All three studies used mortality rather than QALYs (quality adjusted life years) as an outcome measure, and all were described as having potentially serious limitations, including poor applicability to UK context, insufficient time horizons or lacking sensitivity analyses.

A narrative systematic review of controlled studies of the effectiveness of alternatives for people over the age of 65 who are at risk of potentially avoidable hospital admission summarised studies by patient group[12]. For an RCT in patients with stroke (Kalra 2000/2005) this review, unlike the Cochrane review above, expanded the comparison to the three study arms and compared HaH with both general inpatient care with stroke team and a specialist stroke unit. Mortality or institutionalisation at 1 year were lower in the stroke unit group when compared with general ward (14% versus 30% p<0.001) or HaH group (14% versus 24%, p=0.03). The proportion of patients alive without severe disability at 1 year was also significantly higher on the stroke unit compared with the general ward (85% versus 66% p<0.001) or HaH (85% versus 71% p=0.002). The total costs of stroke care per patient (over 12 months) were £11,450 for the stroke unit group, £9,527 for the general ward group and £6,840 for the HaH group. Stroke is frequently an exclusion criteria in HaH studies.

For 'acutely ill older people' the systematic review identified three small non-randomised comparative studies of admission avoidance HaH. All three were at high risk of bias due to methodology, for example in using historical controls. Two of the studies concerned 'hospital in the nursing home' interventions. In each study the HaH interventions resulted in

shorter length of stay and similar re-admission rates when compared with inpatient admissions.

Randomised controlled trials

An RCT published subsequently to the systematic reviews included an economic analysis and was conducted across three hospitals in one UK NHS Trust[3]. Patients with acute exacerbation of chronic obstructive pulmonary disease (ECOPD) admitted to hospital and identified as at low mortality risk (Dyspnea, Eosinopenia, Consolidation, Acidemia and Atrial Fibrillation score, DECAF 0-1) were randomised to HaH under the care of a hospital respiratory team, (n=60, mean age 71.0) or to usual hospital care (n=58, mean age 68.7). Usual care (UC) focused on prompt discharge. The authors of the study emphasised that, since all or most of the admission was avoided, the HaH intervention differed from early supported discharge and encompassed patients who were more unwell. Key outcomes are outlined in table 3.

Table 3: Outcomes of Echevarria et al RCT[3]

	HaH (n=60)	Usual hospital care (n=58)
Length of hospital stay at 90 days, median (IQR)	1 (1–7) *	5 (2–12) *
Death at 90 days, n (%)	1 (1.7)	1 (1.7)
Patients with one or more hospital re-admissions, n (%)	22 (36.7)	23 (39.7)
Patients with one or more A+E attendances post discharge, n (%)	29 (48.3)	26 (44.8)
Patients with one or more GP attendances post discharge, n (%)	26 (43.3)	30 (51.7)
Patients with one or more secondary care appointments, n (%)	48 (80.0)	41 (70.7)
Stated preference for HaH care at day 14, n (%)	54 (90.0)	51 (87.9)
Health and formal social care costs 90 days	£3,857.8 (3,199.6) Mean difference £−1,015.7	£4,873.5 (5,631.1) (95% CI £−2,735.5 to £644.8)
*p=0.001		

Length of stay was significantly shorter in the HaH group (p=0.001) with similar clinical outcomes between groups as measured by use of A+E, GP and secondary care services up to 3 months post-discharge. There was one death at follow up in each study group. Three quality of life instruments were used at 14 and 90 days, and at each measurement there

was a greater proportion of patients reporting a minimum clinically important change in score in the HaH group than the UC group. The between-group difference was only statistically significant for two of the measurements (Hospital Anxiety and Depression Scale at 14 days and COPD Assessment Tool at 90 days). When asked at day 14, around 90% of all patients in the trial stated that they would prefer HaH to UC for future exacerbations of similar severity.

Mean 90-day costs of health and formal social care (the primary outcome of the study) were £1,016 lower in HaH group. The difference in cost was driven by reduced bed days. The probability of HaH being cost-effective compared with UC was 90% at the NICE threshold of £30,000 per QALY. The authors note that extending the analysis beyond 90 days may have been preferable to identify any potential difference in re-admission rates.

A pilot RCT conducted over a two-month period in two centres in the US was identified[13]. This small study (n=20) compared direct costs of an acute care episode of HaH with inpatient hospital admission. Patients were aged 18 or over and were being admitted from the emergency department due to infection, heart failure, COPD or asthma. The nine patients randomised to HaH had median age 65 years (interquartile range (IQR) 28), whilst the inpatient group (n=11) had median age 60 (IQR 29) years. All patients were chronically ill and were frequent users of healthcare. Direct costs included non-physician labour (physician costs were excluded), monitoring, medication, laboratory costs, radiology and transport. The median direct cost associated with HaH for the acute care episode was 52% (IQR, 28%; p= 0.05) lower than for hospital inpatients. Median length of stay in both groups was three days and there were no adverse safety events or transfers back to hospital in the Hospital at Home group. Patients in both study groups expressed high satisfaction with their care experience. In a survey of eight HaH staff members there was no indication of burnout although it was acknowledged by the authors that the short duration of the study was not able to assess burnout, which may develop over time when the intervention no longer provides novelty[14].

Ongoing randomised controlled trials

One ongoing RCT was identified. This is a multi-site, UK based trial (ISRCTN60477865) to investigate the effectiveness of geriatrician-led admission avoidance HaH compared with usual inpatient care in settings where health and social care provision vary[5]. The primary outcome is 'living at home' at six months follow up (the inverse of death or living in residential care setting), other outcomes include length of stay, re-admission or transfer to hospital, quality of life, patient and caregiver experience and resource use, cost and cost effectiveness. The trial aims to enrol 1,055 participants and the intention is to publish findings at the end of 2019. A qualitative process evaluation will be conducted alongside this trial to inform clinical practice and contextualise trial findings[4].

A protocol for a pilot RCT in the Netherlands (n=143) comparing HaH with usual hospital care for patients with cognitive impairment was identified (NL6406)[15].

Non-randomised comparative studies

A quasi-experimental study conducted in Spain allocated older people with chronic conditions and acute medical crises to either geriatrician-led HaH (n=57, mean age 84) or hospital care in an intermediate care geriatric unit (ICGU) (n=114, mean age 87)[16]. Allocation was not by randomisation but was based on availability of resources and caregivers, so there was high risk of selection bias. Study groups differed on important characteristics. For example, the proportion of participants living in a nursing home was 15.8% for the group receiving HaH compared with 43% for those receiving care in the ICGU. Outcomes included proportion of patients discharged to primary care, proportion referred to an acute care unit or death during 30 days following discharge. There was no statistically significant difference between groups in any of these outcomes, either before or after adjustment for potential confounders including age, diagnosis, level of function and impairment and place of residence. Adjusted length of stay was shorter in the ICGU when compared with HaH (8.2 days versus 9.7 days, p<0.01).

A US case-control study compared outcomes of HaH bundled with 30 days of post-acute transitional care (n=295) with those of inpatient care (control, n=212) for patients with acute medical illness requiring inpatient-level care[17]. The control group comprised patients who refused HaH or who presented to the emergency department (ED) at times of day/weekend when HaH was not an option. Adjustment for confounding was by inverse probability weighting. The majority of patients were aged 65 or over (79%). Length of stay was significantly shorter for the HaH group (3.2 days versus 5.5 days, p<0.001). Rate of all-cause hospital re-admission during the 30-day post-acute period was lower for the HaH group (8.6% versus 15.6%, p<0.05). Patients rated their care according to domains of the Hospital Consumer Assessment of Healthcare Providers and Systems Survey (HCAHPS). HaH patients gave higher ratings of care than control patients for communication with nurses and physicians. Scores for pain management were lower for HaH patients (p=0.004). Authors hypothesised that fewer opportunities to titrate pain medication and more physical activity by patients in their homes may challenge pain control.

A retrospective propensity score matched analysis used patient-level administrative data from three Scottish Health Boards to compare healthcare costs and mortality rates associated with unscheduled hospital care and geriatrician-led admission avoidance HaH services[18]. Data on all patients ≥65 who were or would be eligible for HaH and were admitted to either service between August 2014 and December 2015 (two sites) and between January 2015 and December 2016 (one site) was included. Follow up period was six months from the index discharge. Comparisons between groups are outlined in table 4.

Propensity score matching was applied to address confounding. HaH patients were generally older and more socioeconomically disadvantaged, and with a greater number of previous admissions then those receiving inpatient care. Also, there was higher proportion of women and people with multiple co-morbidities in the HaH groups. The costs of

providing HaH were primarily driven by staff costs and varied by site. The costs during follow-up were largely driven by acute not-elective admissions.

Findings were different for each site, see table 4

- For site 1, the healthcare cost during index admission in HaH and over the six months after index discharge was, on average, 18% lower than admission to hospital. When the index admission cost was excluded the costs in the six months following discharge were on average 27% higher for recipients of HaH than for those receiving inpatient care.

- For site 2 there was, on average, no difference between total costs of the two services. When the index admission cost was excluded the costs in the six months following discharge were on average 9% higher for recipients of HaH than for those receiving inpatient care.

- For site 3, the healthcare cost during index admission in Hospital at Home and over the six months after index discharge was, on average 15% higher than admission to hospital. When the index admission cost was excluded, the costs in the six months following discharge were on average 70% higher for recipients of HaH than for those receiving inpatient care.

Table 4: Findings of analysis of Scottish HaH services[18]

	Site 1		Site 2		Site 3	
Unadjusted data	HaH	Hospital	HaH	Hospital	HaH	Hospital
Admissions	1,737	13,139	1,463	3,994	433	1,844
Mean length of index admission days (Standard Deviation)	5.54 (5.23)	8.18 (13.13)	7.35 (5.50)	6.10 (8.74)	4.34 (4.19)	6.36 (11.27)
% deaths during index admission	1	6	3	6	1	4
% deaths at 6 months	28	21	32	22	27	17
Propensity score matched analysis	n=13,267		n=4,769		n=2,110	
Total costs, index admission + six months following discharge (ratio of means, 95% CI)	0.82 (0.76 to 0.89) p<0.001		1.00 (0.92 to 1.09) p=0.982		1.15 (0.99 to 1.33) p=0.073	
Total costs during the six months following discharge (ratio of means, 95% CI)	1.27 (1.14 to 1.41) p<0.001		1.09 (0.95 to 1.24) p=0.219		1.70 (1.40 to 2.07) p<0.001	
Mortality during follow up RR (95% CI)	1.09 (1.00 to 1.19) p=0.059		1.29 (1.15 to 1.44) p<0.001		1.27 (1.06 to 1.54) p=0.011	

The analysis found an increased risk of mortality during follow up at all three HaH sites, but conclusions on this were limited by the possibility of residual confounding. The study authors highlighted potential confounders not included in the analysis, such as the use of community and social services prior to admission and also noted the risk of confounding by indication where patients in particular clinical situations are more likely to be referred to one or other service. This may not have been fully adjusted for in the analysis.

A similar study from a single centre in the US retrospectively compared outcomes for veterans who received HaH (n=127) with those receiving inpatient care (n=692) using propensity score matching to adjust for confounding[19]. There was no significant difference between groups in mortality (p=0.91) or re-hospitalisation (p=0.40) at 30 days post discharge. The rate of nursing home admission was greater in the inpatient care group (p<0.01). The mean total cost of the index event for HaH was $7,792 whilst the inpatient index event cost was $10,960 (p<0.01).

Research findings: what works for whom, why and when?

To better understand findings from trials of effectiveness of interventions, it is helpful to consider the findings of studies which examine why a particular intervention may be beneficial or not, whether there are particular individuals for whom an intervention works better than others, or whether there certain components of an intervention or aspects of the surrounding context that are essential or important for its effectiveness to be realised. Relevant studies on Hospital at Home which fall into this category are described below. These comprise qualitative research and evaluations.

Qualitative research

A qualitative study was conducted alongside the UK multi-centre RCT in patients with COPD described earlier to examine potential drivers and potential barriers to acceptance of Hospital at Home[2]. Semi-structured interviews with patients (n=44), carers (n=15) and HaH staff (n=30) were conducted. Barriers to implementation included: fear of being alone when unwell in case condition deteriorates, and privacy concerns around people coming into one's home. Facilitators to implementation included: comfort in home environment, improved sleep and nutrition, and less disruption to family and social life. Patients in the usual care arm of the study were discharged home earlier than expected, which was hypothesised to be due in part to factors associated with the study, including increased physician awareness of low risk of death and pressure from patients who were disappointed about their allocation to usual care.

Another qualitative study employed two semi-structured focus groups and seven individual interviews with HaH staff members and stakeholders to explore barriers and facilitators encountered in the first year of setting up a HaH programme in the United States[20]. Themes which may be applicable to the Scottish context included:

- Policy and regulatory hurdles – required negotiations and 'work-arounds' / changes to policies, some of which necessitated additional skills training/ accreditation/ certification.

- Internal and external partnerships – these need to be developed or enhanced early in the implementation of a programme – to facilitate adaptation to new ways of working.

- Recruiting and identifying patients – required clarity around eligibility, promoting the service to referrers, educating and building trust, allaying safety concerns. Preventing informal caregiver burnout during HaH was also considered.

- Coordination of services –informants highlighted the importance of teamwork and communication (including documentation) in preventing delays, managing expectations and developing clear specific protocols in place to guide workflow.

- Electronic patient health records – systems need to be adapted to work flexibly within new models of care.

Benefits to starting the programme slowly so that processes can be modified using quality improvement principles were noted.

Evaluations

A UK paper with literature search to 2014 described the development of an evidence-informed evaluation framework for a service providing acute care at home (@home) for patients in south London[21]. The project identified a range of components to be evaluated, which were outlined under objectives relating to structure, process and outcomes as in table 5.

Table 5: Aspects of evaluation of @home intervention[21]

Structure	Staff experience and skill mix Staff training and preparation Flexibility and trans-disciplinary working Hours of operation to meet patient needs
Process	Referral numbers – accepted and decline Meeting of capacity targets Number of patients refusing the service and reasons for this Appropriateness of number and length of home visits Equity of access to service
Outcomes	Length of stay Patient satisfaction and preference Health related quality of life Morbidity – disease specific outcomes Reduction in health inequalities Adverse incident reporting and complications Re-admission rates

Findings of one part of the evaluation have been published[22]. Patient satisfaction with aspects of the service were explored using a 20-question survey with thematic analysis of free text comments. Response rate was low (206/1426, 14%), which limited the interpretation of findings. Patient satisfaction was high, with 99% of survey respondents reporting being very satisfied or satisfied, and 97% of respondents noting that they would be likely or very likely to recommend the @home service. Areas identified for ongoing investigation included the extent to which staff sought patients' views about their condition or treatment and around pain control, with 11% of respondents reporting extreme or severe pain. Free text comments were submitted by 48 respondents. The tone of these was appreciative of staff attributes and generally supportive of the service. Patients preferred having treatment at home and reported feeling safe within the service. The need for improved access to patient records during visits was noted by the evaluation authors.

A mixed method review of comprehensive geriatric assessment (CGA)[23] published in 2019 includes details of previous service evaluations conducted on services within NHS Fife and NHS Lothian.

NHS Fife Service Evaluation

The CGA admission avoidance Hospital at Home service in Fife is an Integrated Community Assessment and Support Service. It reported that 1317 patients received care through the service between April 2012 and March 2014, with 1015 patients (77%) receiving the service as an alternative to admission and 302 patients (23%) receiving step-down care following discharge from hospital. The average length of stay for the service was nine days and the majority of conditions for which people received treatment were respiratory conditions (e.g. asthma, COPD, influenza or pneumonia). The age range of those who received the service was between 23 and 102 years (mean age of 79 years and median age of 81 years),

and 972 (72.5%) were aged ≥ 75 years. The service evaluation included semi-structured interviews with five patients and three caregivers on their experience of Hospital at Home, and, in addition, 49 medical staff completed an electronic survey on their perception of Hospital at Home. For the patients' and caregivers' experiences of Hospital at Home, the following points were reported:

- Patients valued the opportunity of being in familiar surroundings when ill, and stated that support from family and friends was important.

- Patients reported feeling safe and reported that the Hospital at Home nurses contributed to this.

- Patients and caregivers reported apprehension at being admitted to an acute hospital.

- Caregivers reported that they appreciated their family members receiving hospital-level services at home.

- Caregivers reported that being able to maintain their own daily routine was important.

Of the 49 medical staff who responded to the electronic survey, the majority were GPs and the remainder were hospital-based doctors. The majority of respondents reported positive experiences with the single point of access to make referrals and reported that they were aware of the types of patients who were suitable for Hospital at Home. Other findings included the following:

- Information provided on discharge from Hospital at Home sometimes lacked detail and format, and GPs reported having to follow up with Hospital at Home staff to clarify information.

- The majority of respondents reported that Hospital at Home reduced the number of hospital admissions.

- Approximately half of the respondents reported that Hospital at Home had increased their workload.

- The majority of respondents reported that patients and caregivers had benefited from Hospital at Home.

NHS Lothian (West Lothian) Service Evaluation

The admission avoidance Hospital at Home service with the CGA in West Lothian is called REACT (Rapid Elderly Assessment Care Team). From May 2013 to March 2015, the service assessed 845 patients, amounting to 5925 health-care days that might otherwise have occurred in hospital. The mean age of patients was 82.03 years [standard deviation (SD) 6.71 years] and 40.1% of patients were male. In terms of residency prior to receiving the service, 80.4% lived in their own home, 10.8% lived in sheltered housing and 8.9% lived in a nursing home. The primary diagnosis was 39.2% falls/decline in mobility (39.2%), infection

(32.1%) and delirium (11.1%). The mean number of referrals per month was 37.5 (SD 11.0 referrals) and the mean time from referral to first assessment was 90 minutes (SD 146 minutes).

The mean length of stay in the service was 7.1 days (SD 5.9 days); 204 patients (27.4%) were admitted to hospital within 7 days and 226 patients (30.4%) were admitted to hospital within 30 days.

The service evaluation reported the number of patients who had died following their episode of care. At 30 days, mortality was 12.2% (n = 91 patients), and at 90 days mortality was 19.7% (n = 142 patients). The length of stay and number of referrals were reported for two months in 2015: in January 2015, the average length of stay was 4.47 days, the number of referrals was 56 per month and the number of discharges per month was 47. In February 2015, the average length of stay was 4.93 days, the number of referrals was 60 and the number of discharges was 46. It is not clear from the service evaluation whether or not all referrals were admitted. A patient carer experience survey was conducted by West Lothian in September 2013 and seven people responded. All seven reported that home was the best place to be seen by a nurse or a therapist and 85.7% (n = 6) felt that home was the best place to be seen by a doctor.

Models of Hospital at Home described in the identified literature

International approaches

A number of different models for Hospital at Home are described in the studies included in the literature review of the effectiveness of this intervention. Many of these are from jurisdictions other than the UK and therefore operating within a different healthcare setting, social, political, cultural and economic context from the UK, and more specifically Scotland.

The Belgian Healthcare Knowledge Centre[24] undertook a large scale piece of work in 2015 to examine varying approaches to delivering Healthcare at Home in different countries and to use this information to work with stakeholders in Belgium, considering the Belgian context, to make recommendations for the local implementation of the service. The systems studied were in Valencia and the Basque country in Spain, France, the state of Victoria in Australia, and the Netherlands. The report of this work illustrates the range and nature of the models of delivery available.

Hospital at Home services are operating in various trusts across England.

One example of a service in NHS England is that offered by Guy's and St Thomas' NHS Foundation Trust. The development of their @home service is described in a paper published in 2015[21] and current configuration outlined on their website (https://www.guysandstthomas.nhs.uk/our-services/community-at-home-service/overview.aspx)

The @home service is nurse-led, but includes dedicated GP and consultant sessions. The overall area served has a socially and culturally diverse population of 610,000 (2015) and over 150 languages are spoken. The service aims to take up to 300 new patients per month and focuses on reducing avoidable hospital admissions and supporting rapid and safe discharge from three London hospitals' accident and emergency (A&E) departments, acute assessment units and acute wards. Referrals are made by in-reach nurses and GPs, as well as community teams and the ambulance service. The scheme provides intensive input, with treatments, interventions and monitoring for a short period during an acute episode of ill health.

The scheme operates 365 days per year from 8 am until 11 pm. Typically patients receive visits up to four times a day during their episode of care, which on average ranges between three and seven days. The patients are assessed within two hours of referral. The most frequently occurring conditions/interventions for which patients are admitted include:

- chronic obstructive pulmonary disease
- heart failure
- IV antibiotics
- complex falls
- hyper/hypotension, hyper/hypoglycemia

- hyponatraemia
- palliative care
- deteriorating renal function
- post-operative care
- hyperemisis
- trial without catheter post-surgery

A summary of the staffing is:

- 1 clinical lead/deputy head nursing 8B
- 4 clinical matrons 8A
- 1 practice development matron 8A
- 1 clinical pathway matron 8A
- 10 band 7 nurses (3 of which are hospital in-reach);
- 17 band 6 nurses
- 7 band 5 nurses
- 13 rehabilitation support workers
- 1.5 pharmacists

- 4 GPs
- 8 sessions of consultant geriatrician input
- 1 band 8A physiotherapist (therapy lead), 2 band 7 physiotherapists, 4 band 6 physiotherapists;
- 2 band 6 occupational therapists;
- 2 full time social workers
- 1 business support manager – band 6
- 5 admin support staff – band

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Appendix 2 - Scottish Government's Survey of NHS Boards on Hospital at Home Provision

Integration Authority Survey

A short survey was carried out to establish which areas had a Hospital at Home service in place, and where Hospital at Home was not available what alternative services were available.

Responses were received from 25 out of 31 Integration Authorities. The survey identified:

- 10 Integration Authorities with a Hospital at Home type service in place. These appear to be small-scale initiatives at present, with only three areas confirming the service covered the whole partnership area.

- 14 Integration Authorities with an alternative provision in place.

- 16 had a single point of referral in place.

- 16 areas had GPs with special interest in Intermediate care or Hospital at Home. There are also 12 GPs with extended roles across Ayrshire & Arran, matched to specialties.

It is clear that there is a range of intermediate care services currently in operation, many of which are carrying out some, or all, of the functions of a Hospital at Home service, and we should not underestimate the contribution that these services play in reducing hospital admissions and lengths of stay.

Performance

A number of respondents provided limited data on the number of patients admitted to their services, and estimated hospital bed days saved. The data show that there is potential to reduce hospital admissions, and associated bed days through the development of Hospital at Home, alongside other intermediate care services.

However, there is a wide variation in the way the data are collected and more work needs to be done to establish a robust data collection method for admissions to Hospital at Home, and other intermediate care services.

- Lanarkshire Hospital at Home service admitted over 2,000 patients during 2018, with a saving of over 14,000 bed days.

- City of Edinburgh Hospital at Home admitted 693 patients during 2018/19, with a saving of over 2,500 bed days.

- Midlothian Hospital at Home admitted 372 patients during 2018/19, with a saving of 2,600 bed days.

- West Lothian Hospital at Home admitted 763 patients during 2018/19, with a saving of over 3,000 bed days.

- East Ayrshire Enhanced Intermediate Care Team received 3,500 referrals during 2018/19, with a saving of 9,500 bed days.

- South Ayrshire Enhanced Intermediate Care Team received around 1,700 referrals during 2018/19, with a saving of around 7,000 bed days.

- Falkirk's Enhanced Community Team admitted 353 patients during 2018/19, with a saving of 3,580 bed days saved.

Reablement → Intermediate care at Home → Enhanced Intermediate care at Home → Bed-based Intermediate care → Hospital at home

Range of Intermediate care Services

Through the survey, and other work, we have identified a broad range of intermediate care services in operation. The table below provides a short description of each type of service, alongside a practical example.

Description	Service example
Reablement	
A time-limited episode of enabling / restorative support at home, where care workers work with an individual and their family to build their confidence and encourage independence after an illness or decline in function	Dumfries and Galloway Health and Social Care Partnership introduced the Short Term Assessment Reablement Service to maximise service user knowledge, capacity and confidence to live independently at home by learning or relearning skills necessary for daily living, including exposure to valued social and community experiences. The service receives between 80 and 90 referrals per month, with on average 63% achieving independence as defined by their personal goals, resulting in no reliance on formal care with an estimated cost avoidance of over £3m in terms of social care and a little under £150k in terms of acute inpatient costs.
Intermediate care at home	
When reablement home care is augmented by time-limited assessment, treatment, rehabilitation and support at home by an integrated and interdisciplinary team (e.g. Allied health professionals, nurses, doctor, pharmacist, social worker, home carers).	The Red Cross Home from Hospital service provides short-term (up to 21 days) support to people leaving hospital and provides an assessment of their ability to remain home with support. This allows for informed decisions about long-term care to be made at home, rather than a hospital setting.
Enhanced Intermediate care at home	
Similar to above, GP-led with nursing and medical support.	Aberdeenshire Virtual Ward (VCW) aims to support people at a point of vulnerability, typically, an acute illness or deterioration in their condition so that they can remain in their own home. The VCW comprises a multi-disciplinary meeting on a daily basis where any of the team can identify a person at risk and then, as a team, determine what actions can be taken to support the individual. To date, the

	VCW have had 5000 patients considered "admitted" and more than 1600 avoided admissions to hospital.
Bed based Intermediate care	
A time-limited episode of intermediate care provided in dedicated beds within a care home, housing with care, or community hospital setting. This may be as step up beds (admitted from home for assessment and rehabilitation as an alternative to acute hospital admission) or as step down beds (transfer from acute hospital for ongoing rehabilitation).	Aberdeen City commissions 19 rehab flats and 20 rehab beds in a care home. A specialised rehab treatment suite, with a practice kitchen and bathroom is available to support transition back home or to the community.
Hospital at Home or hospital in the home	
A time-limited (days to a few weeks) episode of enhanced intermediate care at home as an alternative to being treated in an acute hospital and where the care is overseen by a specialist consultant / equivalent (e.g. primary care physician with an interest).	Lanarkshire has the largest Hospital at Home service in Scotland, in operation since 2011. It provides acute-level care in the patient's own home. With 64 virtual beds across three geographical hubs, the service received over 2,000 referrals during 2018, with 79% managed entirely at home.

Links with the Framework for Integrated Health and Community Care Services

These service models are reflected in the draft framework for community health and social care integrated services, which will be submitted to the Ministerial Strategic Group for Health and Community Care on 18th September 2019.

Based on an analysis of the published evidence and identified good practice, the draft framework identifies the need to embed a reablement ethos across all services, along with the development of a range of intermediate care models in line with local needs as key components of effective, sustainable integrated care. Furthermore, the framework recognises the need for fully integrated community teams, aligned to general practice and offering liaison services to care homes. These, combined with ready access to expert advice and support from acute care, are key to a prevention and early intervention approach that will improve outcomes for people and deliver tangible benefits across the health and social care system.

It is therefore clear that there is a strong case for the development of this range of services and aligning their capacity to the identified need within each Integration Authority.

Appendix 3 - ISD Hospital at Home data analysis, January 2020

NHS Scotland Information Services Division (ISD) have conducted preliminary analyses on Hospital at Home data. It should be noted that this does not provide the complete picture of activity in Scotland, as it is based only upon data that has been supplied to them and meets the ISD definition of Hospital at Home. However it does help to illustrate current levels of activity.

**Table 1:** Hospital at Home admissions by Year of Discharge

NHS Board	2014	2015	2016	2017	2018	2019^	Total
NHS Fife	177	1839	2138	1980	1714	1447	9295
NHS Grampian	0	0	0	0	95	301	396
NHS Lanarkshire	278	1990	2864	3004	3072	2829	14037
NHS Lothian	0	1295	1859	2196	2476	2407	10233
Total	**455**	**5124**	**6861**	**7180**	**7357**	**6984**	**33961**

*Not all services cover whole Health Board areas. Data collection for Boards meeting ISD definition started in 2014. One additional board is in discussion with ISD for data capture.

^2019 data is provisional and may not be complete

Source: ISD, Hospital@Home data (Developmental Data Set)

Figure 1: Hospital at Home treatment episodes by age and sex for each health board
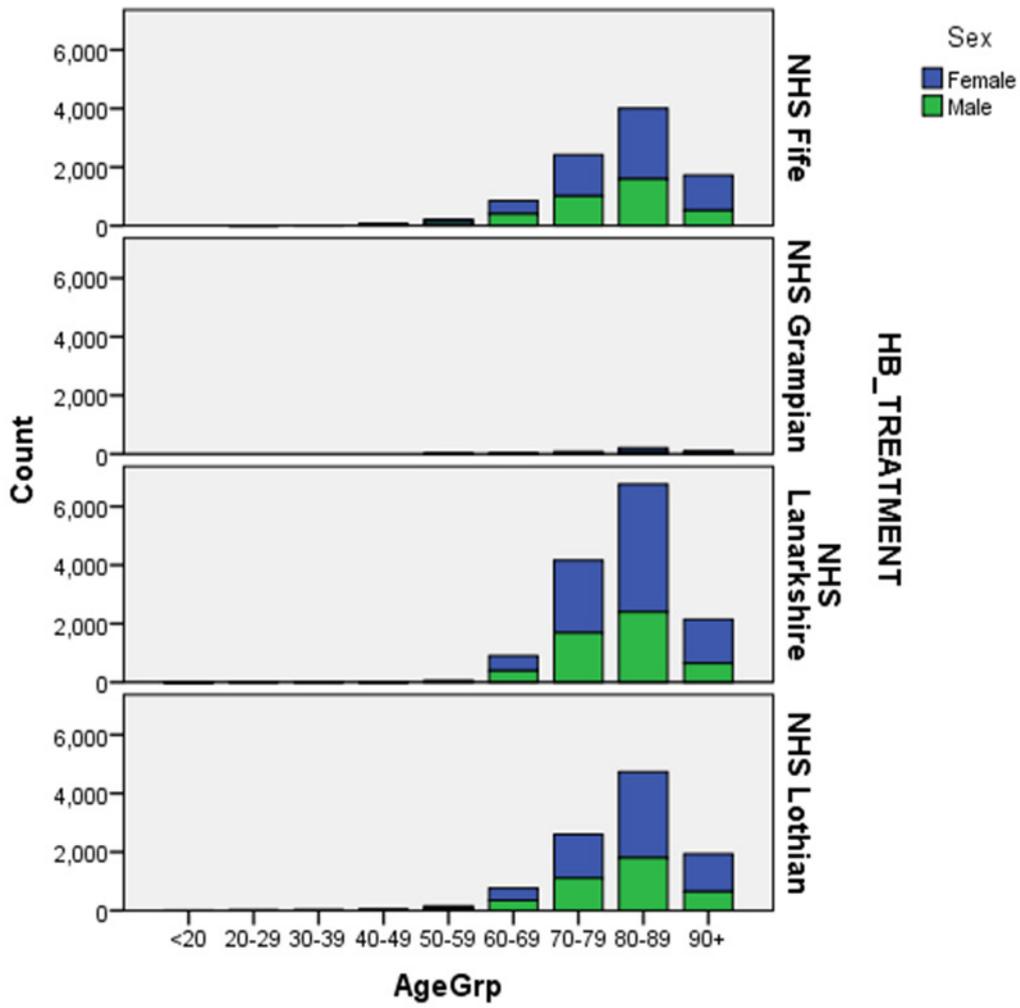
Source: ISD, Hospital@Home data (Developmental Data Set).

Table 2: Main Condition treated by Health Board

Main Condition	NHS Fife	NHS Grampian	NHS Lanarkshire	NHS Lothian	Total
Total	9295	396	14037	10233	33961
Diseases of the respiratory system	2306	30	3845	2343	8524
Symptoms signs and abnormal clinical and laboratory findings, not elsewhere classified	2446	169	2249	2512	7376
Diseases of the circulatory system	777	15	1607	1191	3590
Diseases of the genitourinary system	1176	24	1396	850	3446
Mental and behavioural disorders	637	33	874	563	2107
Diseases of the musculoskeletal system and connective tissue	247	29	662	596	1534
Certain infectious and parasitic diseases	294	7	744	337	1382
Diseases of the skin and subcutaneous tissue	454	5	292	393	1144
Endocrine nutritional and metabolic diseases	442	8	393	300	1143
Injury, poisoning and certain other consequences of external causes	77	40	626	350	1093
Diseases of the digestive system	175	16	495	271	957
Neoplasms	102	9	369	230	710
Diseases of the nervous system	71	6	217	167	461
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	38	0	209	105	352
Factors influencing health status and contact with health services	36	5	33	12	86
Diseases of the ear and mastoid process	12	0	19	5	36
Diseases of the eye and adnexa	1	0	7	8	16
Congenital malformations deformations and chromosomal abnormalities	4	0	0	0	4

Source: ISD, Hospital@Home data (Developmental Data Set).

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or email contactpublicinvolvement.his@nhs.net

Healthcare Improvement Scotland

Edinburgh Office	Glasgow Office
Gyle Square	Delta House
1 South Gyle Crescent	50 West Nile Street
Edinburgh	Glasgow
EH12 9EB	G1 2NP
0131 623 4300	0141 225 6999

www.healthcareimprovementscotland.org