Deloitte Access Economics

Economic analysis of Hospital in the Home (HITH)

Hospital in the Home Society of Australasia

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Glossary

AIHW	Australian Institute of Health and Welfare
ALOS	average length of stay
AR-DRG	Australian Refined Diagnostic Related Group
COPD	chronic obstructive pulmonary disease
DAE-DEM	Deloitte Access Economics' Demographic Model
DoHA	Department of Health and Ageing
DVT	deep vein thrombosis
HITH	Hospital in the Home
NHCDC	National Hospital Cost Data Collection
NHMD	National Hospital Morbidity Database
RCT	randomised control trial

Executive Summary

Hospital in the Home (HITH) involves the provision of acute, sub-acute and post-acute treatments by health care professionals at a patient's usual place of residence as a substitute for inpatient care received at a hospital.

Most states and territories in Australia have HITH programs under which admitted patients are provided with hospital care in the home. However, Victoria accounted for 75% of all HITH activity in Australia in 2009 (Victorian Healthcare Association, 2009). In 2008-09, Victorian hospitals undertook 32,462 public hospital separations with HITH care (AIHW, 2010b). Additionally, NSW data suggests that 17,000 patients were treated through NSW Health's Community Acute/Post Acute Care out-of-hospital program in 2007-08 (Department of Health NSW, 2008).

The drive for HITH care in developed countries such as Australia has been due to:

- rising health care costs increasing the need to reduce inefficient health care expenditure;
- growth in the demand of inpatient care in the context of limited public hospital bed supply;
- shifting demographics;
- hospital access issues;
- increased responsive to consumer preferences; and
- the development of portable hospital technologies, better drugs and delivery devices.

Deloitte Access Economics was commissioned by the Hospital in the Home Society of Australasia to investigate the cost effectiveness of HITH care relative to hospital care.

Outcomes with HITH care relative to hospital care

Three Cochrane reviews on HITH were used to examine clinical outcomes of early discharge and admission avoidance HITH versus traditional hospital care (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009). Evidence from these studies suggests that mortality outcomes and hospital readmissions are not significantly different between HITH care and hospital care. However, it was found that HITH care significantly decreased hospital length of stay and increased total days of care with HITH. This is supported by Victorian data (DLA Phillips Fox, 2010).

Analysis of individual studies within the Cochrane reviews suggests there is higher patient satisfaction with HITH care compared to hospital care. This finding extends across a range of different conditions with no consistent evidence of increased carer burden with HITH.

Costs of HITH care: review of studies

Critics contended that HITH offers inferior care compared to hospital care, and also results in greater costs (Larkins et al, 1995; Shepperd, 2005). However this conclusion ignores the fact that HITH care encompasses a variety of different contexts and is a heterogeneous entity (MacIntyre et al, 2002). This means cost-effectiveness of HITH is specific to the

intervention. Costs of HITH care relative to hospital care are influenced by several factors, including:

- specific condition being treated and severity of condition;
- patient characteristics (e.g. age, gender) and patient selection criteria for HITH;
- hospital discharge criteria with HITH;
- degree to which HITH actually substitutes hospital care days with home care days;
- precise implementation of HITH (e.g. care team composition, number of daily home visits);
- hospital level factors (e.g. geography, patient throughput, scale); and
- perspective of the costing evaluation (health care provider, patient, society).

A review of Australian and international studies was conducted. HITH has the potential to offer lower cost care compared to hospital across a wide variety of conditions and contexts.

Economic analysis of HITH care relative to hospital care

Economic modelling was conducted for inpatient hospital care versus HITH care for selected AR-DRGs in public hospitals.

Based on the Cochrane reviews it was concluded that clinical outcomes (mortality and hospital readmissions) for inpatient hospital care and HITH care are equivalent (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009). Therefore a cost minimisation analysis was deemed appropriate.

In order to gain a broad representation of the various conditions that can be treated using HITH, six commonly occurring AR-DRGs treated using HITH were chosen. These also consistently feature in peer-reviewed literature and include:

- cellulitis;
- venous thrombosis;
- pulmonary embolus;
- respiratory infection/inflammation;
- chronic obstructive pulmonary disease (COPD); and
- knee replacement.

Using six separate AR-DRGs also allowed the cost minimisation analysis to capture expected variability in costs within HITH programs. Cost included in the analysis consisted of public hospital costs for inpatient stay per separation (fixed and variable costs) and costs associated with HITH separations, including a proportion of hospital inpatient costs and specific HITH costs (e.g. nurse time during home visits and travel, costs of informal care, travel expenses).

When the cost of informal care was included (i.e. taking an economy wide perspective), HITH care was found to be less costly than hospital care for all AR-DRGs except COPD, where it was estimated to be 6% more expensive (Table i). The reason for the increased cost for COPD was that cost savings from the use of HITH care relative to hospital care primarily depend on the degree to which HITH care reduces inpatient hospital stay and increases total treatment period. The lowest degree of substitution was found for COPD.

Table i: Cost per HITH separation and cost per hospital separation from a societal perspective[a]

AR-DRG	AR-DRG code	HITH care costs	Hospital care costs	Difference (HITH - hospital)	Cost ratio (HITH/hospital)
		$ per separation	*$ per separation*	*$ per separation*	*%*
Cellulitis	J64B	3,260	4,546	-1,286	72
Venous thrombosis	F63B	2,784	3,688	-904	75
Pulmonary embolus	E61B	4,112	4,873	-761	84
Respiratory infection/ Inflammation	E62C	3,446	3,593	-147	96
COPD	E65B	4,751	4,481	270	106
Knee replacement	I04Z	18,457	19,359	-902	95

(a) Assuming two hours of informal care per day in home care.
Source: Deloitte Access Economics calculations.

On average, results from the cost minimisation analysis using an economy wide perspective indicated that HITH care would cost 22% less than hospital care per separation across all six AR-DRGs.

These results were based on the assumption that the average level of informal care per day was two hours. This assumption was tested by determining the amount of informal care hours that must be delivered before HITH care costs the same as hospital care. Modelling suggests cellulitis, venous thrombosis pulmonary embolus, respiratory infections and knee replacement would all require relatively high hours of daily informal care for HITH care and hospital care to be equivalent (8.7 hours, 6.0 hours, 6.6 hours, 2.6 hours and 5.9 hours respectively). For COPD, the total cost of a HITH care separation was found to exceed the total cost of a hospital care separation. With 1.0 hour of daily informal care, HITH care and hospital care would be equivalent for COPD. Excluding the costs of informal care (i.e., taking a government perspective), HITH care was found to be cheaper relative to hospital care across all six AR-DRGs (Table ii).

Table ii: Cost per HITH separation and cost per hospital separation from a government perspective[(a)]

AR-DRG	AR-DRG code	HITH care costs	Hospital care costs	Difference (HITH - hospital)	Cost ratio (HITH/hospital)
		$ per separation	*$per separation*	*$per separation*	*%*
Cellulitis	J64B	2,875	4,546	-1,671	63
Venous thrombosis	F63B	2,331	3,688	-1,357	63
Pulmonary embolus	E61B	3,785	4,873	-1,088	78
Respiratory infection/ Inflammation	E62C	2,910	3,593	-683	81
COPD	E65B	4,221	4,481	-260	94
Knee replacement	I04Z	17,990	19,359	-1,369	93

(a) Excludes the cost of informal care.
Source: Deloitte Access Economics calculations.

Potential cost savings from expanding HITH care

The current level of public HITH separations were estimated to calculate the potential cost savings to government from switching care from hospitals to HITH for the six AR-DRGs investigated.

Increasing HITH public hospital separations by 10% for the six selected AR-DRGs was estimated to result in potential cost savings to the government of $1.7 million. Switching all current public hospital separations for the six AR-DRGs to HITH was estimated to result in potential cost savings of $108.6 million to government. The greatest potential cost savings were associated with expanding HITH care for cellulitis.

However, any expansion of HITH must take into consideration potential costs and benefits that have not been included in this study. For example, there may be a restructuring cost associated with a large expansion of HITH care. Furthermore, removing nurses from hospitals to deliver HITH care may result in less expense for some types of separations (as found within this report), but it may also reduce the number of patients a nurse can care for within a day. This would generate an opportunity cost through lost productivity that should be considered if deciding to expand HITH care. Additionally, an expansion of HITH is expected to generate additional benefits to society by freeing up hospital beds and creating greater access to hospital care.

Conclusion

These results suggest HITH may provide lower cost care compared to hospital care while achieving equivalent clinical outcomes. Consequently there is an argument to increase access to HITH for those conditions where health outcomes are found to be equivalent or better. This could create savings to government and increase the choice of care for eligible

patients, thereby meeting patient preferences and generating higher patient satisfaction with the health care system (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009).

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1 Background

1.1 Hospital in the Home

Hospital in the Home (HITH) involves the provision of acute, sub-acute and post-acute treatments by health care professionals at patients' usual place of residence, as a substitute for inpatient care received at a hospital (Caplan et al, 2006; Viney et al, 2001). Treatments given at home are generally the same as those received by a patient in a hospital. In many cases, patients remain under the care of their treating clinician and some are still considered inpatients. Participation in HITH is voluntary and usually offered to stable patients who have adequate support at home.

HITH care *substitutes* for hospital care, and can therefore reduce or eliminate inpatient stay in a hospital facility. There is a distinction between HITH which completely substitutes hospital stay (admission avoidance) and HITH which shortens hospital length of stay (early discharge).

Patients treated in admission avoidance HITH often have a common condition, a relatively uncomplicated diagnosis and well-defined treatment that is safe to deliver at home. Hence, admission avoidance is generally used to treat genitourinary, respiratory, skin, joint and soft tissue infections and thrombo-embolic disorders (DLA Phillips Fox, 2010).

Those treated by early discharge HITH more commonly receive post-surgical care and may have less common diagnoses which involve complex specialist in-patient treatment (DLA Phillips Fox, 2010).

Other categorisations of HITH are those based on team composition. Most HITH teams are nurse-based, but some may include doctors and allied health workers (Caplan and Brown, 1997).

Distinction may be made between HITH by specialty in terms of:

- medical;
- surgical;
- rehabilitation; and
- psychiatric care.

Further distinctions may be made in terms of sub-specialties or specific diagnostic groups treated.

The drive for HITH in developed countries has been due to a number of factors. Rising health care costs over the last half century have increased the need to reduce inefficient health care expenditure. Health care expenditure in Australia has increased from around 3.9% of GDP in 1960-61 to 9.0% in 2008-09 (AIHW, 2010a). Higher spending on public hospital services was the largest component of the overall spending increase in 2008-09. Absolute population increase and demographic ageing are expected to further increase cost pressures in Australia (NHHRC, 2009; The Treasury, 2010).

Demand for inpatient care has been growing in Australia in the context of a limited public hospital bed supply. There was a 37% increase in hospital admissions over the last decade with public hospitals accounting for 60% of all admissions. At the same time, the number of public acute hospital beds has fallen by 30% (AIHW, 2009).

Shifting demographics, increased responsiveness to consumer preferences and perceived weaknesses in hospital care such as hospital acquired infections have further lead to a growing interest in HITH (Shanahan et al, 2001). Other incentives include the development of portable hospital technologies, better drugs and delivery devices, better domestic technologies (mobile telecommunication and housing), hospital access issues and desire of patients for more personal care (Montalto, 2010).

1.1.1 HITH in Australia

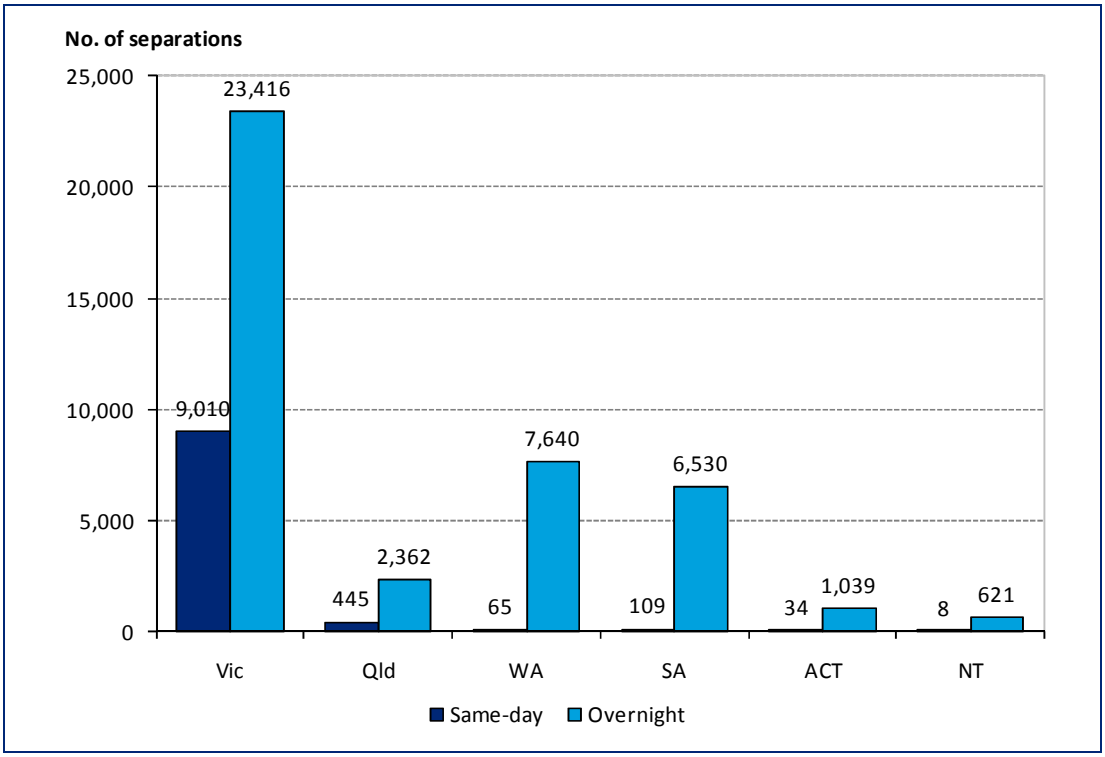
Most states and territories have HITH programs under which admitted patients are provided with hospital care in the home. The Australian Institute of Health and Welfare (AIHW) defines care as occurring in the patient's (permanent or temporary) place of residence as a substitute for hospital accommodation, and within a separation of care for an admitted patient (AIHW, 2010b).

The AIHW National Hospital Morbidity Database reported private and public hospital separations with an HITH element in 2008-09, excluding NSW and Tasmania. AIHW data for HITH activity in NSW and Tasmania were not available as these states did not provide information to the National Hospital Morbidity Database.

Estimated HITH separations in public hospitals are presented for jurisdictions (excluding NSW and Tasmania) in Chart 1.1. For those jurisdictions presented, there were 51,279 public hospital separations with HITH care in 2008-09. Of these, 41,608 were overnight separations and 9,671 were same-day separations. Same-day separations are those where admission and separation to total care (inpatient and HITH) occurred on the same day. This would suggest that these separations had one day or less of HITH care. Recorded overnight separations generally involved some care delivered within the hospital followed by some care at home (George Bodilsen, Head of AIHW Hospitals Data Unit, pers. comm. 24 March 2011) and thus were a form of early discharge HITH.

Additional data suggests a substantial number of HITH care separations occur in NSW. NSW data from NSW Health's Community Acute/Post Acute Care out-of-hospital program indicates that 17,000 patients were treated through this program in 2007-08 (Department of Health NSW, 2008).

Chart 1.1: Public hospital separations with HITH care 2008-09



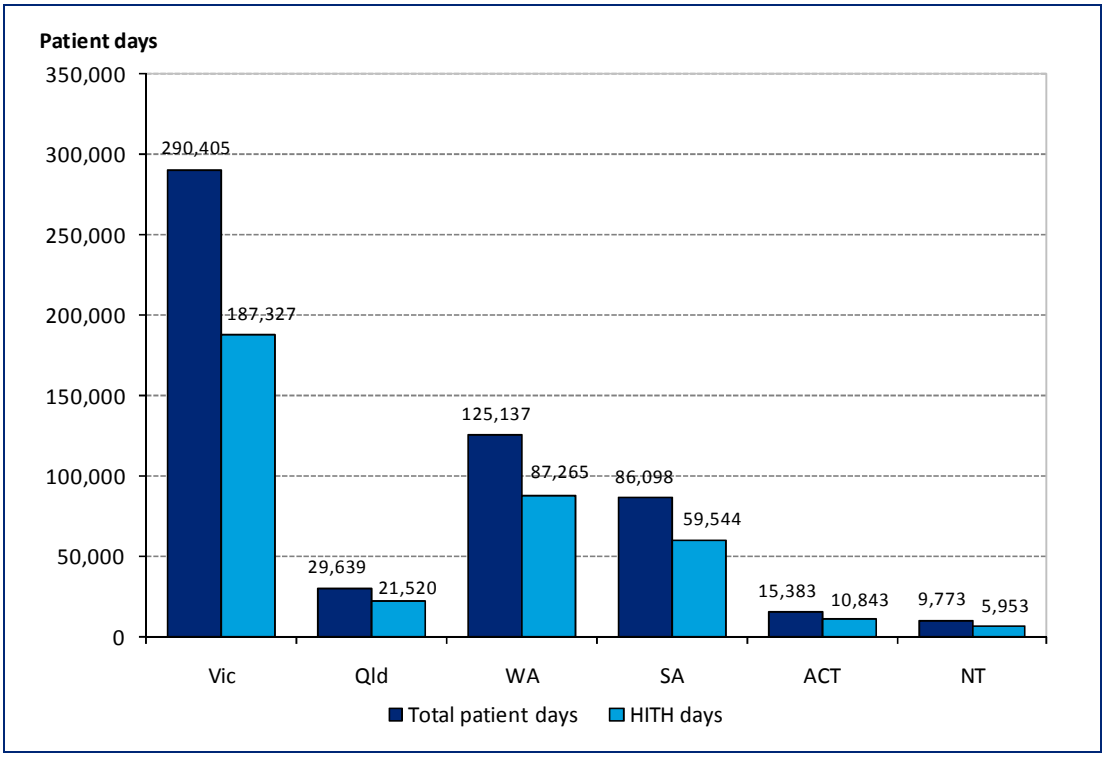
Note: AIHW data for HITH activity in NSW and Tasmania were not available as these states did not provide information to the National Hospital Morbidity Database.
Source: AIHW (2010b).

Private hospital separations with HITH care were not reported for NSW and Tasmania as these states did not submit data to the AIHW National Hospital Morbidity Database. Additionally, data was not available for the ACT and NT as these data were unpublished.

Excluding NSW, Tasmania, ACT and NT, there were 9,188 separations with HITH care in private hospitals in 2008-09. There were a higher number of reported HITH same-day separations in private hospitals (6,503) as compared to overnight separations (2,683).

In 2008-09, public hospital overnight separations with HITH care accounted for a total of 556,435 days for reporting states (i.e. excluding NSW and Tasmania) including 372,452 care days at home (67% of total) (Chart 1.2). Again, Victoria had the highest total number of patient days for overnight separations with HITH care, of all reporting states.

Chart 1.2: Public hospital separations with HITH care - patient days in 2008-09



Note: AIHW data for HITH activity in NSW and Tasmania were not available as these states did not provide information to the National Hospital Morbidity Database.
Source: AIHW (2010b).

For overnight separations with HITH care in private hospitals, there were 60,761 total patient days excluding NSW, Tasmania, the ACT and the NT. Of these, 48,807 days were for care at home.

The AIHW reported on the 'average length of stay' (ALOS) for public hospital overnight separations including a HITH care component for all states excluding NSW and Tasmania. Total treatment period and ALOS in hospital were reported. Estimates are presented in Table 1.1.

The total treatment period (including home care days) for all reporting states was 13.4 days. Excluding the home care component, the ALOS for all reporting states was 4.4 days.

Table 1.1: Average length of stay for public hospital overnight separations with HITH

	Vic	Qld	WA	SA	ACT	NT	Total
Total treatment period (days)	12.4	12.5	16.4	13.2	14.8	15.7	13.4
ALOS in hospital (days)	4.4	3.4	5.0	4.1	4.4	6.2	4.4
Home care days/ total treatment period (%)	65%	73%	70%	69%	70%	61%	67%

Source: AIHW (2010b).

Both private and public hospital data on separations show that HITH care is more prevalent in Victoria than in other states. This reflects widespread implementation of HITH programs in Victoria since the first pilot program in 1994 (DLA Phillips Fox, 2010).

In recent years, HITH activity in Victoria has increased substantially. The Victorian Healthcare Association reported that 3.1% of hospital patients in Victoria were seen in their homes and that Victoria accounted for 75% of all HITH activity in Australia in 2009 (Victorian Healthcare Association, 2009). Nearly all Victorian hospitals now have a HITH program. Collectively, these accounted for 32,462 public hospital separations in 2008-09, representing 2.5% of all inpatient admissions and 5% of all bed days in Victoria (AIHW, 2010b; Montalto, 2010).

1.1.2 HITH care by diagnostic related group

HITH care is a preferred delivery mode for a core range of conditions. HITH care has been provided for conditions including:

- treatment of infectious diseases (e.g. endocarditis, septic arthritis, pneumonia, treatment of cellulitis using intravenous antibiotics);
- treatment of diabetes and diabetic complications, respiratory failure and complex chronic illnesses;
- provision of parental nutrition, blood transfusion and percutaneous endoscopic gastrostomy where services are usually provided in acute, inpatient settings;
- complex wound care and ulcer management;
- the provision of cardiac treatment and rehabilitation (e.g. the post-operative management of patients after cardiac surgery, atrial fibrillation, endocarditis);
- home infusion therapy including chemotherapeutic agents, antibiotics, analgesics, immunologic agents and enzyme replacement;
- oncology and palliative care; and
- post-surgical care (e.g. knee replacement, repair of fractured hips, breast surgery).

The Victorian Admitted Separations Dataset includes information about HITH separations by Australian Refined Diagnostic Related Group (AR-DRG), diagnosis, procedure and length of stay. Generally, there is a set of diagnostic related groups which represent the most HITH separations and bed days in Victoria. These have remained consistent from year to year (DLA Phillips Fox, 2010).

Available data indicates cellulitis was the top ranking AR-DRG for HITH bed days and the top ranking individual condition for HITH separations in Victoria (Table 1.2).

Since AR-DRG codes may not be applied consistently, there are issues with mapping these to the clinical view of the separation of care. An example is the AR-DRG Z64B ('other factors influencing health status') where a large proportion of patients are allocated. This was the first-ranking AR-DRG for separations in Victoria and third-ranking AR-DRG for bed days in Victoria in 2008-09 (Table 1.2). Health services that code for this AR-DRG are likely to have a relatively high number of HITH separations, high proportion of same-day separations, lower ALOS and a higher per capita rate of HITH (DLA Phillips Fox, 2010).

Table 1.2: Top 15 AR-DRGs for HITH separations and bed days in Victoria, 2009

AR-DRG	Descriptor	Rank: bed days	Rank: separations
J64B	Cellulitis	1	2
F63B	Venous thrombosis	2	5
Z64B	Other factors influencing health status	3	1
K01Z	Diabetic foot procedures	4	65
E63Z	Sleep apnoea	5	4
E61B	Pulmonary embolism	6	8
T61A	Postoperative and post-traumatic infections	7	29
I12A	Infection of bone and joint	8	78
F71B	Non-major arrhythmia	9	13
I04Z	Knee replacement	10	17
E60A	Cystic fibrosis	11	49
Z63B	Other after care procedures for infectious diseases with complications	12	15
T01A	Osteomyelitis	13	89
I64B	Other colonoscopy	14	84

Source: DLA Phillips Fox (2010).

Case-mix for 'other factors including health status' is unlikely to be homogenous, with separations coded for (DLA Phillips Fox, 2010):

- insertion and adjustment of vascular device;
- insertion and adjustment of other implantable device;
- laboratory examination; or
- anatomical site of a malignant neoplasm.

The mix of clinical conditions for which HITH care is utilised is partially dependent on HITH care as defined by policy. For example, in 2008 the Victorian Department of Health amended hospital admission policy to require that HITH patients be visited in their residence by clinical staff to provided admitted services. Under this definition, HITH care would exclude telephone calls and care where a person would otherwise have attended an outpatient clinic or ward on a non-admitted basis. This definition also required days where a patient was not visited by HITH staff to be reported as "leave days" during a multi-day stay. The re-definition led to a fall in the overall number of HITH public hospital separations in Victoria from 38,000 in 2007-08 to 32,464 2008-09 (DLA Phillips Fox, 2010). In particular, a substantial reduction was noted for the following AR-DRGS:

- other colonoscopy;
- other gastrocopy;
- follow-up endoscopy;
- other factors influencing health status;
- myringotomy;
- dental extractions;
- vein litigation;

- hernia repair; and
- endoscopic uterine procedures.

Cellulitis (J64B), deep vein thrombosis (DVT) (F63B) and pulmonary embolus (E61B) are three AR-DRGs that are evident in the case-mix for most HITH services in Victoria and also feature consistently in peer-reviewed literature (DLA Phillips Fox, 2010).

Table 1.3 presents number of HITH separations, HITH separations as a percentage of all separations and ALOS in HITH separations (including breakdown by stay in hospital and stay in home) for selected AR-DRGS, using Victorian data. The last column in the table presents inpatient hospital ALOS in Australia for these AR-DRGs (DoHA, 2010).

For most of the AR-DRGs presented, HITH reduces length of stay in hospital but increases the overall length of stay in hospital and home care (i.e. overall period of care). The data on reduced length of stay in hospital indicates that HITH care in Victoria is performing its core function of being substitutable to hospital care at home (Board et al, 2000).

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Table 1.3: Victorian data on HITH separations, selected AR-DRGs in 2008-09 (a)

AR-DRG name	AR-DRG code	HITH separations	HITH/Total separations	Hospital ALOS	Home care component	Total treatment period	Home care/Total treatment period	Same day separations / Total	Average hospital LOS in Australia
		Number	*%*	*days*	*days*	*days*	*%*	*%*	*days*
Other factors influencing health status	Z64B	2,897	24	n/a	1.0	1.0	100	100	1.0
Cellulitis	J64B	1,593	25	0.9	6.1	7.0	87	2	3.7
Venous thrombosis	F63B	848	58	0.6	7.2	7.8	92	4	5.3
Pulmonary embolus	E61B	357	27	2.0	5.2	7.2	72	26	5.0
Coronary bypass without invasive investigative procedures + CSCC	F06A	190	27	8.2	2.1	10.3	20	0	10.1
Chronic obstructive airways disease - CSCC	E65B	98	2	2.7	8.4	11.1	76	8	4.5
Respiratory infection/inflammation - CC	E62C	142	3	1.0	8.5	9.5	90	2	3.2
Chemotherapy	R63Z	1,011	2	n/a	1.0	1.0	100	100	1.0
Lymphoma	R61B	171	12	0.4	2.3	2.7	85	26	4.9
Knee replacement	I04Z	216	12	3.9	7.4	11.3	65	n/a	7.1

Note: (a) Data were reported for only selected HITH services in Victoria for some DRGs (AR-DRG J64B: 39/47 HITH services, F63B: 35/47 HITH services, E61B: 24/47 HITH services, F06A: 5/47 HITH services, E65B: 25/47 HITH services, E62C: 34/47 HITH services).
Source: DLA Phillips Fox (2010) and DoHA (2010).

A survey of all admissions to a medically-managed HITH unit in a large, not-for-profit private hospital in Victoria between March 2000 and December 2007 was recently undertaken (Montalto et al, 2010). A total of 3,423 admissions were examined, of which 2,207 (64.5%) were admitted directly from emergency department or rooms, with the remainder admitted from hospital wards. A total of 26,653 HITH bed days were delivered for these admissions, with an average of 9.3 nursing visits and 4.1 medical visits per admission.

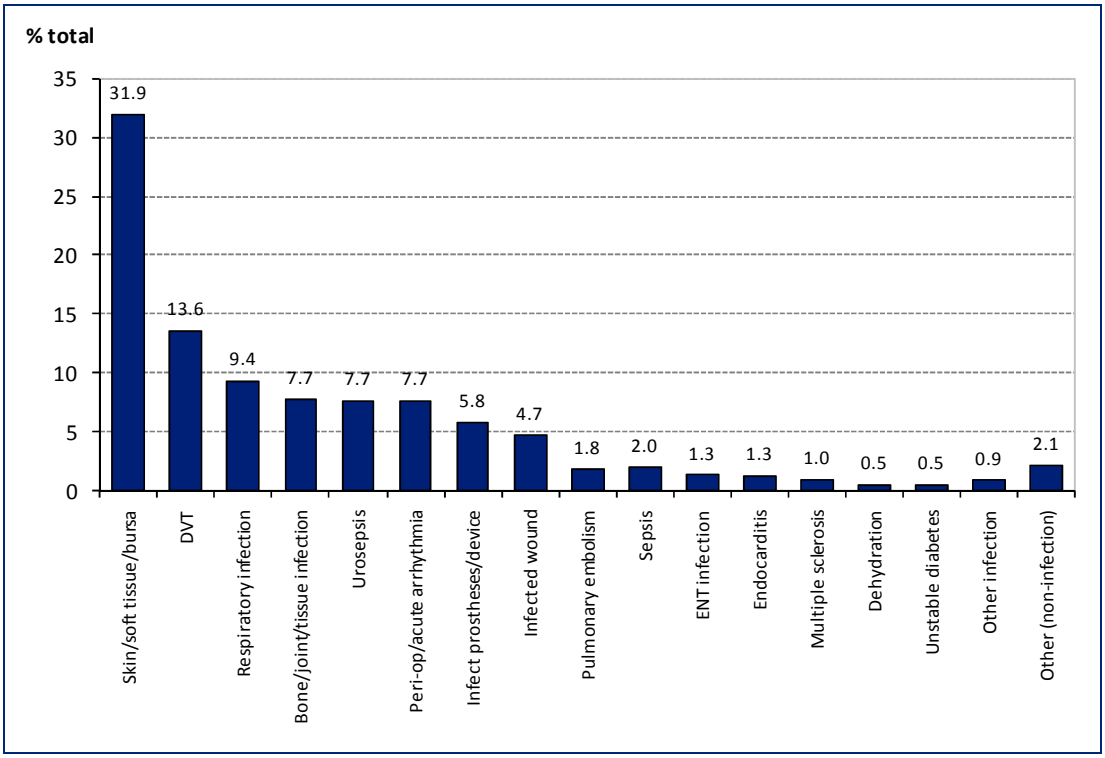
This study presented a breakdown of primary conditions treated in the sample. The distribution of conditions is presented in Table 1.4 and Chart 1.3. The most common condition treated was skin, soft tissue and bursa infections/abscesses (32% of admissions). This was followed by DVT (14% of admissions) and respiratory infections (9% of admissions).

Table 1.4: HITH admissions by condition, HITH single hospital study in Victoria

Primary condition	Frequency	Proportion of total
	number	*%*
Skin/soft tissue/bursa infection or abscess	1091	31.9
Deep venous thrombosis	464	13.6
Respiratory infection	320	9.4
Bone, joint, deep soft tissue infection	264	7.7
Urosepsis	262	7.7
Anticoagulation peri-operative/acute arrhythmia	262	7.7
Infected prostheses/devices	198	5.8
Infected wound	160	4.7
Pulmonary embolism	61	1.8
Sepsis	68	2.0
ENT infection	46	1.3
Endocarditis	45	1.3
Multiple sclerosis	34	1.0
Dehydration	18	0.5
Unstable diabetes	18	0.5
Other infection	31	0.9
Other (non-infection)	73	2.1
Total	**3,415**	**100.0**

Source: Montalto et al (2010).

Chart 1.3: HITH admissions by condition, HITH single hospital study in Victoria



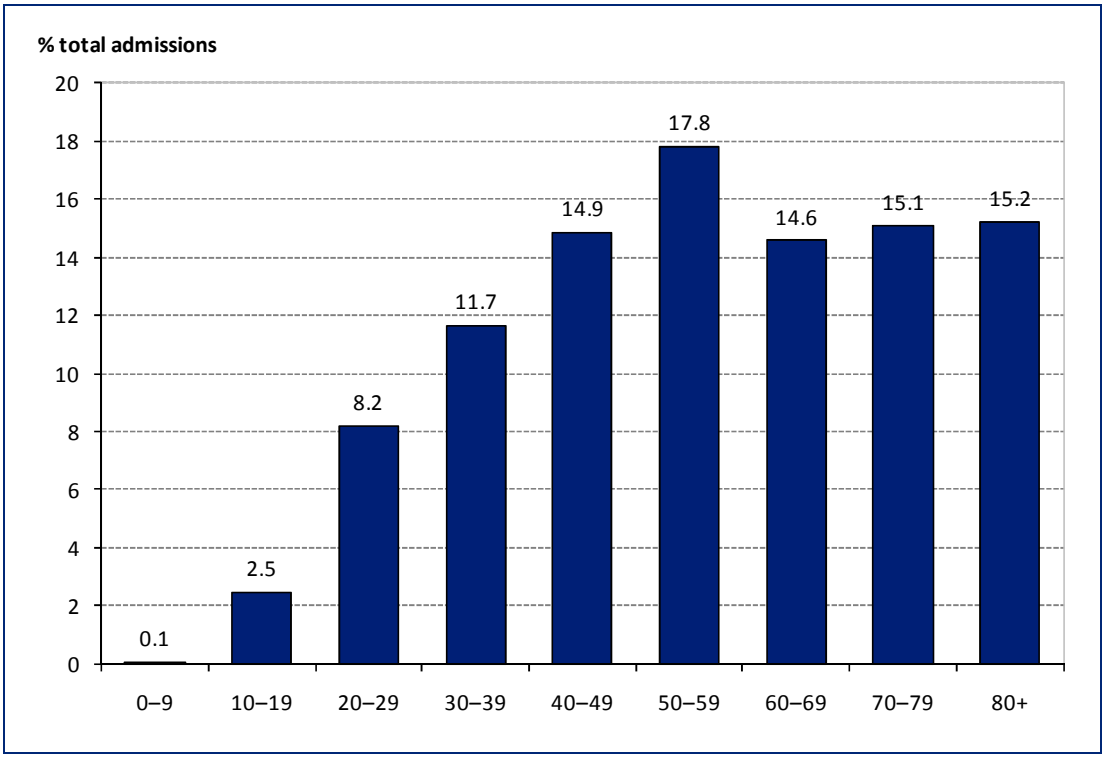
Source: Montalto et al (2010).

1.1.3 HITH care by age and administered treatment

Recent research has noted that the majority of HITH patients who are chronically ill with compound illnesses and require episodic acute care are at older ages (DLA Phillips Fox, 2010). HITH patients who require short-term, intensive medical treatments such as intravenous antibiotics or intensive post-surgical care but not long-term nursing/maintenance are those of varying ages.

A seven year study of all medically-managed HITH at Victorian private hospital presented HITH admissions by age, as shown in Chart 1.4.

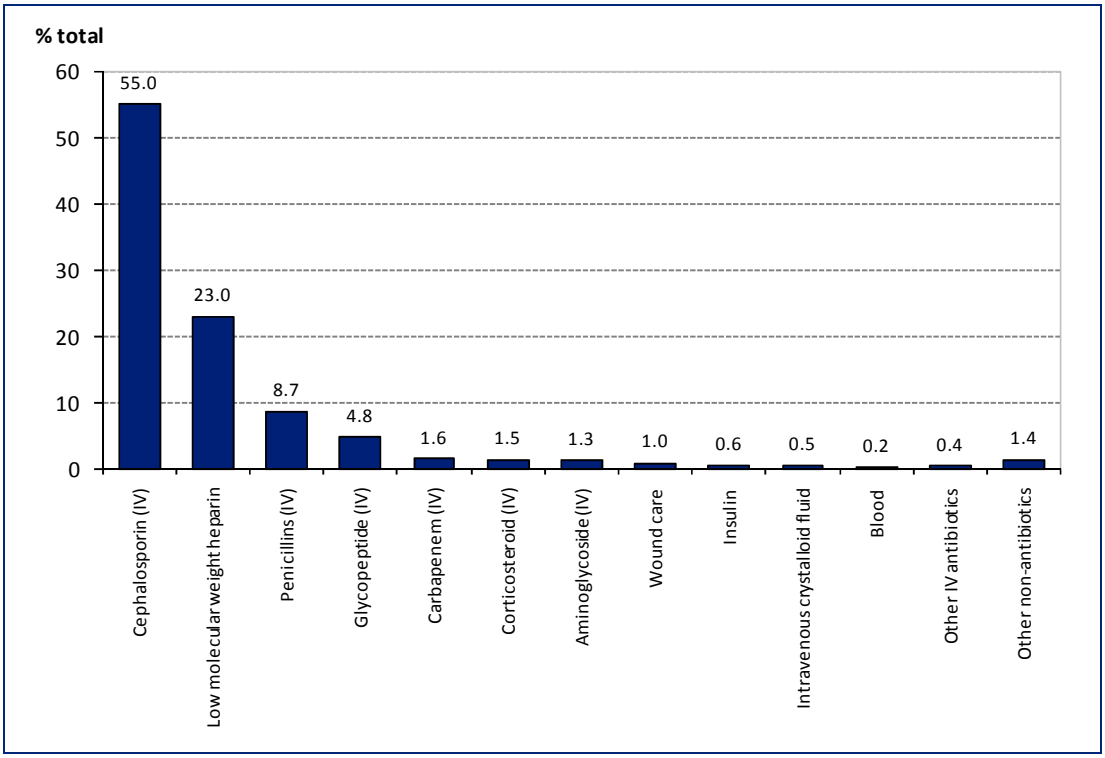
Chart 1.4: HITH admissions by age group, HITH single hospital study in Victoria



Source: Montalto et al (2010).

In this study, there were few HITH admissions in very young age groups (20 years and less). Distribution of admissions across age groups 40 years and older were roughly equal, with the largest number of admissions in the 50 to 59 years age group (18% of admissions). The varying age distribution for this study indicates that HITH care was generally for intensive medical treatments (e.g. intravenous antibiotics). This is indicated by data from the study on treatments delivered in HITH care, with 55% of treatment being delivery of intravenous cephalosporin (Chart 1.5). This is also suggested by the condition distribution for this study, presented in Chart 1.3 with infections comprising a large proportion of primary conditions treated.

Chart 1.5: HITH admissions by treatment delivered, HITH single hospital study in Victoria



Source: Montalto et al (2010).

2 Literature review

2.1 Review of studies: the costs of HITH care

Critics contended that HITH offers inferior care to hospital care and at greater cost (Larkins et al, 1995; Shepperd, 2005). A past Cochrane review found no compelling evidence for cost savings from HITH and that early discharge HITH could prolong total days of care (Shepperd and Iliffe, 2005). An updated Cochrane review also noted early discharge HITH could increase total length of care and thus offset any reduction in hospital length of stay (Shepperd et al, 2009).

Victorian data indicates that HITH care can increase overall length of care for selected AR-DRGs while reducing stay in hospital (Section 1.1.2). However, while HITH may increase overall days of care, the cost-effectiveness of HITH compared to hospital care is dependent on the degree to which hospital care days are substituted with home care days, and the costs of hospital care days relative to home care days. Thus, while HITH may increase total days of care, if HITH care involves a high proportion of home care days and if these are less expensive than hospital care days, a HITH care separation may still cost less overall than a hospital care separation. This issue is investigated in the economic analysis conducted in Chapter 3.

An updated Cochrane review concluded that admission avoidance HITH may be cheaper than acute hospital care (Shepperd et al, 2008) based on two trials examined (Jones et al, 1999; Patel et al, 2004). Older studies have noted that no consensus has been reached on the cost-effectiveness of HITH care relative to hospital care (Bentur, 2001; Corrado, 2001).

However, there has been a growing evidence base conducted in both Australia and overseas on the costs of HITH care. To dismiss overall HITH care as being cost-ineffective compared to hospital care ignores the fact that HITH care encompasses a variety of different contexts and is a heterogeneous entity (MacIntyre et al, 2002). Findings on costs can vary based on differing perspectives of evaluations (e.g. health care provider, societal, patient), conditions, precise implementation of HITH and differences in settings. HITH care costs have been found to be lower after adjusting for confounding factors such as illness type, severity of illness and treatment type (MacIntyre et al, 2002).

HITH costs also vary due to hospital-level factors such as geography, patient throughput and clinical/organisational issues (Haas et al, 1999). Additionally, characteristics of patients influence the costs of HITH which emphasises the importance of appropriate selection criteria for admission to HITH. Appropriate discharge criteria are also needed to ensure HITH care does not unnecessarily extend a separation of care (Haas et al, 1999).

The degree to which HITH actually substitutes for in-hospital care affects the relative cost-effectiveness of HITH compared to hospital care. HITH services where HITH does not substitute for in-hospital care but rather acts as 'add-on' care are bound to be more expensive relative to hospital care (Caplan, 2006). The economic analysis in Chapter 3 attempts to analyse the costs of HITH care and hospital care where HITH does substantially substitute for in-hospital care while increasing total days of care.

2.1.1 Studies in Australia

A number of past studies on the costs of HITH care have been conducted in Australia. Wilson et al (2005) analysed 2000-01 financial data from the Macarthur Acute Ambulatory Care Service program in NSW which attempts to substitute patient hospital care with home care. The Macarthur cost of care data confirmed substantial cost savings relative to hospital care (63%) in selected diagnostic groups (cellulitis, pneumonia) with complete substitution of hospital care. Lower cost savings (50%) were found for partial substitution of care. This study found that cost savings are sensitive to the level of substitution of hospital care with home care, and that cost savings are dependent on choice of ambulatory sensitive diagnoses. This analysis was limited in that costs were analysed only from the hospital perspective (e.g. ward medical, nursing, pathology, etc) and patient outcomes from home care relative to hospital care were not analysed.

A study of the costs of HITH care relative to hospital care in 31 hospitals in Victoria also found that HITH can generate cost savings at the hospital level across a heterogeneous range of acute conditions (MacIntyre et al, 2002). A sample of 924 randomly selected HITH care episodes and 924 matched hospital care episodes were costed after accounting for variance associated with age, gender, comorbidity and other confounders. No significant difference in mortality outcomes was found between HITH and hospital care. Overall, this study found that early discharge HITH episodes were 9% less expensive and admission avoidance HITH episodes were 38% less expensive than hospital care episodes, with both findings statistically significant at a 5% level. This study demonstrated the importance of adjusting for confounding factors that can influence the cost-effectiveness of HITH.

Shanahan et al (2001) conducted a cost minimisation analysis of HITH in rural NSW at six selected pilot hospital sites, assuming equivalent clinical outcomes between HITH and hospital care. The costs of providing HITH services were categorised into consumables, nurse time costs for home visits and travel costs (time and fuel use). The costs of HITH care from the hospital perspective were quantified over the study period through data collection from HITH providers and patients. This analysis compared the cost of HITH care at home for the 15 most frequent AR-DRGs across all sites to the costs that would have applied with an equivalent length of stay in hospital.

Shanahan et al (2001) found that of the 15 AR-DRGs, home care was more expensive on average than if care during that period had been provided in hospital. It was concluded that the relative costs of HITH depends on context and diagnosis. This study also found a high level of acceptance for HITH care by patients and their carers across all sites, through a satisfaction survey. A limitation with findings from this study is that HITH costs in a pilot program may differ considerably from those in full-scale operation. Another limitation is that the evaluation was based on comparing stay at home with an equivalent length of stay in hospital, when Victorian data and Cochrane reviews indicate that HITH reduces stay in hospital and increases total care days (DLA Phillips Fox, 2010; Shepperd and Iliffe, 2005; Shepperd et al, 2008; Shepperd et al, 2009). Additionally, Shanahan et al (2001) examine costs for HITH from a hospital perspective only by excluding costs of informal care.

Another Australian study examined the costs of patients with bacterial infections receiving intravenous antibiotics at home through a pilot program to equivalent inpatient therapy (Grayson et al, 1995). Antibiotics were pre-mixed in a hospital pharmacy and administered by nurses. Treatment at home was found to have no significant complications with cure

achieved in 18 of 20 patients. Measured costs included time costs, drugs, supplies and estimated comparable costs for hospital stays. It was found that HITH care achieved cost savings of at least $112 per day for the 538 days that home therapy was provided. Additionally, it was reported that HITH care allowed additional hospital throughput of between 86 and 107 patients. A limitation of this analysis was small sample size and cost estimation from a hospital perspective only.

Lowenthal et al (1996) analysed the health care costs of chemotherapy at home for cancer patients in an Australian retrospective evaluation of a home oncology nursing service over its first five years (1989 to 1994). This included 5,444 home visits to 424 patients including 1,688 chemotherapy administrations to 179 patients. No major complications were reported with treatment. Detailed costing was conducted over 12 months of the program by comparing direct costs of chemotherapy administration at home or in the hospital's day treatment ward. Under a health care perspective, home care was found to be less expensive than hospital care.

Nicholson et al (2001) undertook a pilot study comparing the clinical outcomes of hospital avoidance HITH and hospital care for COPD at a hospital in Brisbane. The trial consisted of 25 patients aged 45 years and older with COPD requiring hospital admission through the emergency department. Results indicated similar clinical outcomes and patient satisfaction levels at two weeks post-discharge, and a cost minimisation analysis was conducted. Costs for hospital managed patients were estimated through average hospital cost per AR-DRG estimates obtained from hospital-wide cost modelling in past years. Costs of home managed patients included allied health and nursing costs, time costs for home visits, client service management, administrative time, average travel time costs, consumables, travel expenses, costs not related to direct services provision (e.g. advertising, professional development, insurance, legal expenses) and labour costs of administration support and data management. Costs borne by patients were not estimated as they were not required to purchase equipment and supplies or undertake travel. The acute care costs per separation were found to be significantly lower than the hospital group costs per separation.

Board et al (2000) estimated the costs of HITH compared to hospital care for patients with an acute medical condition admitted through the emergency department of a NSW hospital. Costs per hospital care separation were estimated based on average costs per day by AR-DRG, using retrospective cost data from the hospital. Costs per HITH separation included encounter costs, general practitioner visits, pathology, imaging, emergency department costs, disposables, pharmaceuticals and overheads (e.g. fleet costs, cleaning, office supplies). Average costs per HITH separation were found to be 47.5% of the average costs per hospital separation with the result found to be statistically significant.

A prospective economic evaluation from the perspective of health services in the UK failed to detect a difference in total health care costs between early discharge HITH care and hospital care (Shepperd et al, 1998) for patients recovering from a hip or knee replacement or elderly medical patients. A significant increase in health care costs was found with HITH for patients recovering from a hysterectomy and those with COPD. Patient and carer expenditure on health care comprised a small proportion of total costs. A limitation of this study was that costs were assessed only from the perspective of health services. Additionally, Shepperd et al (1998) noted the impact of patient selection on findings with patients discharged early to home care being those whose hospital care was least

expensive. Caplan (2006) noted that this study did not encompass substantial substitution of in hospital care with home care which is a factor behind the cost findings.

2.1.2 International studies

A study in New Zealand of 55 patients compared the costs of home delivered treatment for community-acquired pneumonia with standard hospital treatment (Richards et al, 2005). This study found that the condition could be managed as effectively in the home by primary care teams as in hospital. Costs were calculated from a funder's perspective with actual costs measured for each home care patient for staff time and transport, equipment, pharmaceuticals, support services, administration and laboratory/radiology costs. These were compared to hospital case weight based costs for DRGs, since actual costs of hospital care were not available. Overall, home care was found to cost the funder three-quarters the case weight based cost of hospital care.

Another study in New Zealand of 200 patients found that treatment of cellulitis requiring intravenous antibiotics could be safely delivered at home with patient preference for home treatment (Corwin et al, 2004). However, the study also found that home care costs were increased by having twice daily home visits from nurses. This demonstrates how the costs of HITH care are influenced by the implementation of home care treatment. Corwin et al (2004) concluded that once daily intravenous antibiotics and nurse visits for cellulitis would also be a safe option.

A UK study (Coast et al, 1998) compared the relative costs of early discharge HITH and hospital care for acute conditions from health system, social services and patient perspectives. Costs identified included patient specific or ward costs, unit costs for community services, time costs for home visits and contact and non-contact patient costs. This analysis found HITH costs were lower than continued hospital care costs from all three perspectives.

Patel et al (2004) conducted a full economic evaluation on the costs of admission avoidance HITH for patients with moderately severe stroke in the UK compared to stroke unit care and stroke team care in a general ward. Prospective and retrospective methods were used to identify resource use 12 months after stroke onset. The costs of HITH care included health care, social care and informal care costs. Data on the use of public sector services and informal care were collected retrospectively 12 months after stroke onset, during patient and caregiver interviews, health and social service records and direct observation. Hospital resource use and therapy inputs were recorded on an ongoing basis across all three patient groups. Mean health care and social care costs over 12 months were highest for the stroke unit group and lowest for the home care group. The inclusion of informal care costs did not change these findings.

Jones et al (1999) undertook costing of patients referred to HITH with an acute condition compared to those treated in hospital care in the UK. Identified costs of HITH care included staff inputs, consumables, equipment and overhead costs (e.g. car leasing and travel, administration, management and finance). Staff time spent in contact with patients was identified from nurse surveys. Informal care costs were analysed qualitatively. When analysis was restricted to patients who accepted their allocated place of care, HITH was significantly less costly per separation. Cost per day was found to be higher in the HITH arm, reflecting greater nursing inputs and the economies of scale which apply to hospitals.

Nursing time costs dominated HITH care while inpatient hospital costs dominated the costs of hospital care.

2.1.3 Conclusions

The costs of HITH care relative to hospital care are influenced by factors such as:

- specific condition being treated and severity of condition;
- patient characteristics (e.g. age, gender) and patient selection criteria for HITH;
- hospital discharge criteria with HITH;
- degree to which HITH actually substitutes hospital care days with home care days;
- precise implementation of HITH (e.g. care team composition, number of daily home visits);
- hospital level factors (e.g. geography, patient throughput, scale); and
- perspective of the costing evaluation (health care provider, patient, society).

Critics have claimed HITH offers inferior care at a greater cost (Larkins et al, 1995; Shepperd, 2005). However, HITH is a heterogeneous entity covering a range of different conditions and contexts, which means conclusions on HITH cannot be generalised.

The review of studies in Australia and overseas demonstrates that HITH has the potential to offer lower cost care compared to hospital while delivering equivalent patient outcomes, across a wide variety of conditions and contexts.

2.2 Meta-analyses on HITH outcomes

Past meta-analyses have examined the outcomes of HITH care. A series of three Cochrane reviews examined the outcomes of early discharge and admission avoidance HITH. The earliest review was conducted in 2005 (Shepperd and Iliffe, 2005) with two subsequent reviews in later years to update findings for admission avoidance and early discharge HITH using individual patient data from eligible randomised control trials (RCTs) (Shepperd et al, 2008; 2009).

HITH outcomes examined by the Cochrane reviews (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009) included:

- mortality;
- readmission to hospital;
- hospital length of stay and total length of stay;
- patient satisfaction; and
- carer burden.

The sections below provide an analysis of these studies in terms of methods, limitations and findings.

2.2.1 Methods

To reduce heterogeneity, the Cochrane reviews grouped individual RCTs according to type of HITH (early discharge or admission avoidance) and patient condition. For example, the updated review on early discharge HITH grouped studies into to the following areas (Shepperd et al, 2009):

- those recovering from a stroke;
- older people with a mix of conditions; and
- early discharge following elective surgery.

Based on these groupings, the Cochrane reviews involved many individual meta-analyses. The largest individual meta-analysis was based on six trials examining mortality outcomes in admission avoidance HITH (Shepperd et al, 2009).

Noted inclusion and exclusion criteria in the Cochrane reviews are presented in Table 2.1.

Table 2.1: Noted inclusion and exclusion criteria in HITH Cochrane reviews

Inclusion criteria	Exclusion criteria
• Randomised trials with patients aged 18 years and older comparing HITH with acute inpatient care.	• Evaluations of obstetric, paediatric and mental health care.
• HITH care in the form of community-based, hospital-based through an outreach service, hospice at home (palliative care).	• Services providing long-term care.
• Early discharge and admission avoidance HITH (no stipulation around the quantified hospital length of stay reduction).	• Services provided in outpatient settings or post-discharge from hospital.
• Studies that used standardised validated instruments to measure subjective outcomes.	• Self-care by patients in their own home.
	• Trials where outcomes were assessed by opinion.

Source: Shepperd and Iliffe (2005), Shepperd et al (2008; 2009).

The quality of RCTs was judged using criteria recommended by the Cochrane Effective Practice and Organisation of Care Group, including:

- the concealment of allocation;
- blinded assessment of primary outcomes;
- follow up of patients;
- baseline measurement;
- reliability of primary outcome measures; and
- protection against contamination.

A fixed effects model was employed for meta-analyses in these studies. However, the use of fixed effects model may have been inappropriate as true effect sizes are likely to differ across individual trials. Methodological limitations of these Cochrane reviews and difficulties with drawing conclusions from the meta-analyses are discussed in Section 2.2.3.

In the earliest review, meta-analyses involved the calculation of odds ratios using Peto fixed effects for mortality and hospital readmission using published data (Shepperd and Iliffe, 2005). The later follow-up studies on early discharge and admission avoidance used individual patient data to calculate hazard ratios for mortality and readmission (Shepperd et al, 2008; 2009). Length of stay effects were compared through weighted mean differences. Patient satisfaction and carer burden were analysed individually for each RCT. Statistical significance of outcomes was analysed at a 5% significance level

2.2.2 Findings

Mortality

Findings on mortality from Shepperd and Iliffe (2005) are presented in Table 2.2 by patient condition and type of HITH service. None of the meta-analyses found significant differences in mortality at a 5% significance level, as indicated by the large p-values for the summary effects. Shepperd and Iliffe (2005) noted that included trials were small and meta-analyses were underpowered to detect differences in mortality. A reduction or increase in mortality with HITH care could not be concluded.

Table 2.2: Mortality – HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		odds ratio	*p-value*
Early discharge			
Elderly medical	3	1.79	0.1
Elderly medical: chronic obstructive airways disease	5	0.62	0.2
Elderly medical: patients recovering from stroke	4	0.78	0.3
Admission avoidance			
Mix of medical conditions	2	0.77	0.4

Source: Shepperd and Iliffe (2005).

The subsequent Cochrane reviews updated meta-analyses for early discharge and admission avoidance HITH using individual patient data where possible (Shepperd et al, 2008; 2009).

The mortality findings of the updated review on early discharge HITH are presented in Table 2.3. No significant differences were found in mortality outcomes for early discharge HITH care versus inpatient hospital care

Table 2.3: Mortality – early discharge HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		risk ratio	*p-value*
Mortality at 2-3 months			
Chronic obstructive airways disease	4	0.50	0.08
Mortality at 3 months			
Older people with a mix of medical conditions	6	1.12	0.56
Patients recovering from a stroke	6	1.05	0.90
Mortality at 6 months			
Patients recovering from a stroke	6	0.83	0.50
Mortality at 1 year			
Patients recovering from a stroke	4	0.96	0.84

Source: Shepperd et al (2009).

Mortality findings of the review on admission avoidance HITH are presented in Table 2.4. No significant differences were found in mortality outcomes for admission avoidance HITH care versus inpatient hospital care at three months follow-up for elderly patients with a medical condition or using individual patient data for overall admission avoidance HITH.

However, a significant reduction in mortality at six months follow-up for overall admission avoidance HITH was found based on three trials. Further examination of the three trials included in this meta-analysis revealed insignificant differences in mortality outcomes between HITH and inpatient hospital care within each individual trial (Kalra et al, 2000; Ricauda et al, 2004; Wilson et al, 1999). Due to the application of a fixed effects model for meta-analysis, a significant summary effect was found by combining the three trials due to the effect of increased sample size through pooling and greater power. However, this result is expected to be dependent, in part, on the chosen fixed effects model. If a random effects model were used, it is expected the significant result would become insignificant. Therefore it is problematic to conclude HITH truly has a mortality reducing effect at six months.[1]

[1] The limitations of the meta-analyses performed in the HITH Cochrane reviews, inability to draw conclusions on based on these meta-analyses and difference between fixed effects and random effects meta-analysis are further explained in Section 2.2.3.

Overall, a significant difference in mortality outcomes between HITH and inpatient hospital care cannot be concluded based on the results of the meta-analyses in the three HITH Cochrane reviews.

Table 2.4: Mortality – admission avoidance HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		risk ratio	*p-value*
Mortality at 3 months			
Admission avoidance overall (from individual patient data)	5	0.82	0.28
Admission avoidance overall (from individual patient data adjusted for age and sex)	5	0.77	0.15
Mortality at 6 months			
Admission avoidance overall (from individual patient data adjusted for age)	3	0.62	0.005
		odds ratio	*p-value*
Mortality at 3 months			
Elderly patients with a medical condition (published data)	5	0.83	0.36

Source: Shepperd et al (2008).

Readmissions

Findings on hospital readmission from the earliest Cochrane Review (Shepperd and Iliffe, 2005) are presented in Table 2.5 by patient condition and type of HITH service. At a 5% significance level, no differences were found for hospital readmission between HITH and inpatient hospital care for either early discharge or admission avoidance HITH.

Findings on hospital readmission from the updated review on early discharge HITH are presented in Table 2.6. No significant increase or decrease in hospital readmissions with HITH care was found for patients recovering from a stroke at three and six months follow-up, at a 5% significance level. However, a significant increase in hospital readmissions with HITH care was found for older people with a mix of medical conditions at three months follow-up.

Table 2.5: Readmissions – HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		odds ratio	*p-value*
Early discharge			
Elderly medical (3 months follow-up)	2	1.76	0.2
Elderly medical: chronic obstructive airways disease (3 months follow-up)	5	0.81	0.3
Elderly medical: patients recovering from stroke (3 to 12 months follow-up)	3	0.96	0.8
Admission avoidance			
Mix of medical conditions (between 1 to 3 months to hospital admission avoidance)	2	1.33	0.4

Source: Shepperd and Iliffe (2005).

Table 2.6: Readmissions – early discharge HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		risk ratio	*p-value*
Readmission at 3 months			
Patients recovering from a stroke	3	1.06	0.89
Older people with a mix of medical conditions	5	1.35	0.03
Readmission at 6 months			
Patients recovering from a stroke	3	1.00	0.99

Source: Shepperd et al (2009).

Findings on hospital readmission from the updated review on admission avoidance HITH are presented in Table 2.7. No significant differences were found for hospital readmissions for admission avoidance HITH care versus inpatient hospital care at three months follow-up, using published data and individual patient data, at a 5% significance level.

Overall, a significant difference in hospital readmissions between HITH and inpatient hospital care cannot be concluded based on the results of the three Cochrane reviews at a 5% significance level.

Table 2.7: Readmissions – admission avoidance HITH versus inpatient hospital care

Meta-analysis	No. of trials	Summary effect	Statistical significance
		risk ratio	*p-value*
Readmission at 3 months			
Admission avoidance overall (from published data)	5	1.35	0.08
Admission avoidance overall (from individual patient data)	3	1.48	0.09
Admission avoidance overall (from individual patient data, excluding readmissions in the first 14 days)	3	1.41	0.16
Admission avoidance overall (from individual patient data, adjusted for age and sex)	3	1.49	0.08
Admission avoidance overall (from individual patient data, adjusted for age and sex, excluding readmissions in the first 14 days)	3	1.42	0.16

Source: Shepperd et al (2008).

Length of stay

Shepperd and Iliffe (2005) compared weighted mean differences between hospital length of stay and total days of care between hospital care and HITH care. A non-significant reduction in hospital length of stay was observed between groups for trials with early discharge of elderly medical patients. Individual trials for which data could not be pooled (Donald et al, 1995; Widen-Holmqvist et al, 1998; Rudd et al, 1997) reported reductions in hospital length of stay for HITH. Two individual trials for patients with chronic obstructive pulmonary disease (COPD) reported significant reductions in hospital length of stay of just over three days (Ojoo et al, 2002; Shepperd et al, 1998). Additionally, a significant increase in total days of care for HITH was reported by an individual trial for early discharge of elderly medical patients (Ojoo et al, 2002). Similar findings on hospital length of stay and total days of care were found for early discharge HITH for patients recovering from elective surgery and admission avoidance HITH for a mix of medical conditions.

The Cochrane review on admission avoidance HITH (Shepperd et al, 2008) reported varying mean reductions in hospital length of stay across individual trials. Effects on total treatment period were varied for admission avoidance HITH with one trial indicating a reduction (Wilson et al, 1999) and another indicating an increase (Ricauda et al, 2004).

The Cochrane review on early discharge HITH (Shepperd et al, 2009) pooled published data from four trials and found a significant reduction in hospital length of stay for patients recovering from a stroke. Hospital length of stay was found to be lower for remaining trials recruiting patients recovering patients from a stroke. The Cochrane review concluded a significant increase in total days of care with early discharge HITH based on findings from five individual trials. Similar results were found for early discharge following elective

surgery. For older people with a mix of medical conditions, non-significant reductions in hospital length of stay were found in three trials and a significant reduction was found in one trial (Caplan et al, 2006). Older patients with a mix of medical conditions were found to have significantly higher total days of care.

Overall, the combined findings of the three Cochrane reviews indicate a decrease in hospital stay and increase in total days of care for HITH care.

Patient satisfaction

The earliest Cochrane review (Shepperd and Iliffe, 2005) found overall that patients allocated to HITH expressed greater satisfaction than those in hospital. Patient satisfaction was found to be significantly higher in trials of patients recovering from stroke and admission avoidance HITH for patients with a mix of medical conditions. Mixed findings on patient satisfaction were found for early discharge of patients following elective surgery.

The later review on admission avoidance HITH (Shepperd et al, 2008) found that patients reported higher satisfaction with HITH, across a range of different conditions including cellulitis, community acquired pneumonia and elderly patients with a mix of conditions.

The Cochrane review on early discharge HITH (Shepperd et al, 2009) also found patients reported higher satisfaction with HITH. Significantly higher patient satisfaction was found in trials of patients recovering from a stroke and older people with a mix of medical conditions. For early discharge HITH patients recovering from elective surgery, satisfaction findings were mixed. In one trial (Ruckley, 1978), patients perceived an advantage with HITH for themselves but perceived their carers to be at a disadvantage. No significant differences in satisfaction were found in trials of patients recovering from a hip or knee replacement, hernia or varicose vein repair or a fractured femur. One trial reported significantly more women recovering from a hysterectomy allocated to HITH reported being able to resume parental responsibilities (Shepperd et al, 1998).

Overall, findings from the three Cochrane reviews indicate higher patient satisfaction with HITH compared to hospital care, across a range of different conditions and for both early discharge and admission avoidance HITH.

Carer outcomes

Shepperd and Illiffe (2005) found no difference in carer burden for early discharge HITH of elderly medical patients based on three trials using the Carer Strain Index and GHQ 30. For early discharge of patients recovering from elective surgery, one trial found that carer satisfaction was significantly less with HITH care than with hospital care (Adler, 1978). Trials measuring carer satisfaction failed to detect a difference in carer satisfaction for patients recovering from a hip or knee replacement, hysterectomy or fractured femur. For admission avoidance HITH recruiting patients with a mix of medical conditions, one trial reported carers of the HITH group had significantly higher levels of satisfaction compared to those in the hospital group (Caplan et al, 1999). The later Cochrane review on admission avoidance HITH also referenced this trial (Shepperd et al, 2008).

The updated Cochrane review on early discharge HITH (Shepperd et al, 2009) found no difference in carer burden for patients recovering from a stroke, based on four trials. For

older people with a mix of medical conditions, this review found that three trials reported no significant differences in self-reported carer satisfaction between HITH care and hospital care (Gunnell et al, 2000; Ojoo et al, 2002; Shepperd et al, 1998) and one trial reported a greater number of carers in the HITH group were happy with their allocated type of care compared to carers in the hospital group (Ojoo et al, 2002). For early discharge of patients following elective surgery, one trial indicated that carers of HITH patients were less satisfied than carers of hospital patients (Adler et al, 1978). No significant differences in the satisfaction of carers of patients recovering from a hip or knee replacement, hysterectomy or fractured femur were found, based on two trials (Crotty et al, 2002; Shepperd et al, 1998).

2.2.3 Limitations

A primary limitation of the Cochrane reviews was the use of a fixed effects model for meta-analyses. A fixed effects model assumes that all studies in the meta-analysis share the same true effect size and the summary effect is an estimate of this common effect size. Generally, it is relatively uncommon for this core assumption to apply as it requires that all studies be functionally identical (i.e. all variables impacting on outcomes would need to be identical across studies). The studies included for meta-analyses in the three Cochrane reviews varied greatly in terms of patient types (e.g. age, health status, condition), country of location and precise implementation of HITH care (e.g. different care team compositions, differences in length of home care versus hospital care, different treatments). While the Cochrane reviews attempted to group similar studies together by patient condition and type of HITH for meta-analyses, studies would still have had many varying characteristics making the application of a fixed effects model less appropriate.

A random effects model would have been more appropriate for meta-analyses of HITH care as it allows for differences in true effect sizes between studies due to differences in the mix of participants, contexts and implementation of the intervention. The summary effect in a random effects model estimates the mean of the distribution of varying effect sizes.

Under a fixed effects model, the only source of heterogeneity would be from sampling error within studies. As such, the statistical significance of a summary effect in a fixed effects model would always be higher than the statistical significance of the effect size in any individual study. Because sampling error is the only assumed source of error in a fixed effect model, precision would always be dependent on total pooled sample size. In contrast, in a random effects model there are two sources of error, sampling error within studies and variance between studies. For this reason, the significance of a summary effect in a random effects model may be higher or lower than the significance of the effect size in any individual study.

Another limitation of the Cochrane reviews was that selection criteria for studies did not stipulate a quantified reduction in hospital length of stay. This is needed to ensure that studies include sufficient replacement of hospital treatment to properly assess the outcomes of care at home. A critical element of HITH care is that it substitutes for hospital care, rather than being an ‘add-on’ to normal inpatient care (Board et al, 2000). By not including a stipulation around length of stay the Cochrane reviews did not set a minimum requirement for substitution of hospital care.

An additional issue was inclusion of unsuitable studies in the meta-analyses. The earliest Cochrane review (Shepperd and Iliffe) included two studies which simply compared intensities of home care treatment for palliative care patients and did not meet the definition of HITH care (Grande et al, 1999; Hughes et al, 1992).

2.2.4 Conclusions

The Cochrane reviews (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009) found:

- no significant difference in mortality outcomes between admission avoidance and early discharge HITH and hospital care at two to three month and one year follow-up at a 5% significance level;
- a significant reduction in mortality at six months follow-up for overall admission avoidance HITH at a 5% significance level based on three trials;
- no significant difference in hospital readmissions between early discharge HITH care and hospital care for patients recovering from a stroke at three and six months follow-up at a 5% significance level;
- a significant increase in hospital readmissions with early discharge HITH care for older people with a mix of medical conditions at three months follow-up at a 5% significance level;
- no significant difference in hospital readmissions between admission avoidance HITH care and hospital care at three months follow-up at a 5% significance level;
- a significant decrease in inpatient hospital stay and significant increase in total days of care with HITH compared to hospital care;
- higher patient satisfaction with HITH compared to hospital care across a range of different conditions for both early discharge and admission avoidance HITH; and
- no consistent findings of increased carer burden or decreased carer satisfaction with early discharge and admission avoidance HITH.

A fixed-effects model was employed for meta-analyses on mortality and hospital readmissions. This may have been less appropriate than a random effects model due to the likelihood of varying true effect sizes across studies. With a random effects model, it is expected the significant mortality reduction finding at six months follow-up for admission avoidance HITH would become insignificant. A similar outcome would be expected for the significant increase in hospital readmissions with early discharge HITH at three months follow-up for older people with a mix of medical conditions.

Overall, it cannot be concluded from the Cochrane reviews that mortality outcomes or hospital readmissions change with shifting patients to HITH care from hospital care. The finding on decreased hospital length of stay and increased total days of care with HITH is supported by Victorian data on HITH separations for selected diagnostic groups (DLA Phillips Fox, 2010).

Individual analysis of studies in the Cochrane reviews found higher patient satisfaction with HITH care compared to hospital care across a range of different conditions with no consistent evidence of increased carer burden with HITH.

3 Economic analysis

This section presents results from economic modelling of inpatient hospital care versus HITH care for selected AR-DRGs in public hospitals.

Based on findings within Cochrane reviews (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009) that clinical outcomes (mortality and hospital readmissions) with inpatient hospital care and HITH care are equivalent, a cost minimisation analysis was deemed appropriate.

A cost minimisation analysis was performed for six commonly occurring AR-DRGs in HITH services in Victoria which also consistently feature in peer-reviewed literature (from Section 1.1.2, Table 1.3).

The selected AR-DRGs (and number of separations in 2008-09 for each from Victoria data) were:

- cellulitis (1,593 separations);
- venous thrombosis (848 separations);
- pulmonary embolus (357 separations);
- respiratory infection/inflammation (142 separations);
- COPD (98 separations); and
- knee replacement (216 separations).

Cellulitis, venous thrombosis, pulmonary embolus and knee replacements were the first, second, sixth and tenth ranked AR-DRGs, respectively, in terms of bed days from HITH separations in Victoria in 2009 (DLA Phillips Fox, 2010).

Six separate AR-DRGs were compared to capture variability in costs between conditions. Focusing on separate AR-DRGs rather than an 'average' AR-DRG separation provides greater insight into the differences between HITH and hospital care.

The cost minimisation analysis was performed on the premise that HITH care reduces length of stay in hospital compared to the usual length of stay associated with hospital care. Victorian data confirms this with inpatient ALOS shorter for HITH separations than for hospital separations for the six selected AR-DRGs (DLA Phillips Fox, 2010). However, the cost minimisation analysis also accounted for a longer total period of care for HITH separations (including hospital and home stay) compared to hospital separations, which is also confirmed by Victorian data.

Table 3.1 presents length of stay in hospital and at home for Victorian HITH separations and average hospital inpatient stay for these AR-DRGs in Australia (DoHA, 2010). Reduction in hospital length of stay with HITH care relative to hospital care was estimated for each AR-DRG separation by comparing Victorian HITH separation data (DLA Phillips Fox, 2010) with Australian ALOS data (DoHA, 2010). HITH care is estimated to result in the largest reduction in hospital length of stay for venous thrombosis (89%) followed by cellulitis (76%). HITH care is estimated to result in the lowest hospital length of stay reduction for COPD (39%).

Table 3.1: Length of stay – HITH separations versus hospital separations

AR-DRG name	AR-DRG code	HITH separations in Victoria		ALOS for hospital separations	Estimated reduction in hospital ALOS with HITH care(a)
		hospital length of stay (days)	*home length of stay (days)*	*hospital length of stay (days)*	*%*
Cellulitis	J64B	0.9	6.1	3.7	76
Venous thrombosis	F63B	0.6	7.2	5.3	89
Pulmonary embolus	E61B	2.0	5.2	5.0	60
Respiratory infect/inflammation – CC	E62C	1.0	8.5	3.2	69
COPD - CSCC	E65B	2.7	8.4	4.5	39
Knee replacement	I04Z	3.9	7.4	7.1	45

Note: (a) Relative to care purely in hospital. This was estimated by comparing length of hospital stay with HITH from Victorian separations data (DLA Phillips Fox, 2010) with Australian ALOS data for each AR-DRG (DoHA, 2010).

Source: DLA Phillips Fox (2010) and DoHA (2010).

Length of stay differences from Victorian data were used to estimate differences in the total cost of hospital separations and HITH separations. The difference in treatment period and stay in hospital with hospital care and HITH care are graphically represented in Figure 3.1.

From Figure 3.1, the total costs of hospital care would be all costs incurred in period A (time in hospital). This would include all the relevant costs of hospital treatment for a condition (e.g. medical, nursing, surgical costs, supplies).

The total costs of HITH care would be costs incurred in period B (time spent in hospital) and costs incurred in period C (time spent in home care). Time spent in hospital with HITH care would be shorter than with purely hospital care. However, only hospital costs dependent on length of stay (variable hospital costs) would be lower for HITH care separations than hospital care separations. Other hospital costs are expected to be independent of actual length of stay in hospital (fixed hospital costs). The same amount in fixed costs is expected to be incurred for both HITH care separations and hospital care separations.

Costs incurred in period C (home care) include:

- time spent by hospital staff during daily home visits;
- time spent by hospital staff travelling;
- travel expenses (e.g. car expenses and fuel);
- cost of consumables used during home care (not otherwise used in hospital); and
- costs of informal care.

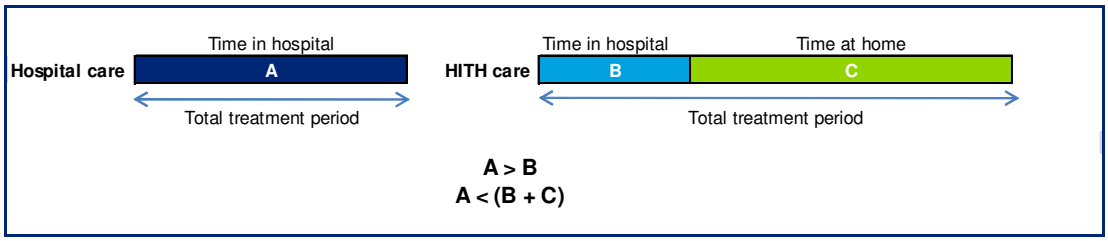
It is assumed that patients are not required to fund their own cost during home care as pharmaceuticals, supplies, equipment and travel would all be provided by the hospital

(Nicholson et al, 2001). Past studies have shown that significant decreases in hospital length of stay do not place an increased expenditure burden on patients after hospital discharge when HITH is part of a coordinated system of care for elective surgical or medical patients (Nicholson et al, 2001).

Hospital staff time was valued at the derived hourly wage rate for registered nurses. Survey data from Australian HITH programs indicates that nurses are the main care providers in HITH patients' homes, which also reflects findings from international literature (Haas et al, 1999). This also follows the approach of another Australian cost analysis on HITH care in NSW (Shanahan, 2001).

Unfortunately there is a lack of data on hours of informal care provided to HITH patients. Conditions under investigation generally allow people to maintain their independence around the home and within society with the exception being knee replacements. It was therefore assumed that a relatively low level of daily informal care (two hours) would apply across conditions during home care. Analysis was conducted around hours of daily informal care needed for each condition to make hospital care costs equivalent to HITH care costs

Figure 3.1: Conceptual map – costing of HITH versus hospital care



Source: Deloitte Access Economics.

3.2 Costs of hospital care separations

3.2.1 Public hospital costs for inpatient stay

The Department of Health and Ageing (DoHA) publishes data on public hospital costs in Australia through its National Hospital Cost Data Collection (NHCDC). This includes estimates of the public hospital costs of patient separations based on ALOS by AR-DRG in Australia. The latest available data is for 2008-09 (DoHA, 2010).

Cost estimates in 2008-09 were converted to costs in 2011 using the average rate of health inflation in Australia.[2] These estimates were used to represent total costs per hospital care separation for the six selected AR-DRGs (Table 3.2).

[2] Costs were inflated at 3.2% per annum, the average annual rate of health inflation between 1998-99 and 2008-09 (AIHW, 2010).

Table 3.2: Total costs per hospital care separation 2011

AR-DRG name	AR-DRG code	ALOS	Total costs
		days	*$ per separation*
Cellulitis	J64B	3.7	4,546
Venous thrombosis	F63B	5.3	3,688
Pulmonary embolus	E61B	5.0	4,873
Respiratory infection/ Inflammation	E62C	3.2	3,593
COPD	E65B	4.5	4,481
Knee replacement	I04Z	7.1	19,359

Source: Deloitte Access Economics calculations using DoHA (2010) and AIHW (2010a).

3.3 Costs of HITH care separations

3.3.1 Public hospital costs for inpatient stay

The NHCDC includes estimates of public hospital costs of patient separations by AR-DRG and by hospital cost centres, production units which create a range of related products (DoHA, 2007). Cost centre categories in the NHCDC are outlined in Table 3.3.

Costs centres are further divided into direct cost centres and overhead cost centres. Direct cost centres are defined as those that are directly involved in the creation of final products and directly attributable to a separation of patient care. Overhead cost centres are defined as those where costs have an incidental rather than direct relationship to a separation of patient care (DoHA, 2007).

Table 3.3: An outline of DoHA NHCDC hospital cost centres

Cost centre	Description
Ward medical	Salaries and wages of all medical officers for acute admitted separations including sessional payments.
Ward nursing	Nursing salaries and wages for acute admitted separations in general ward areas.
Non-clinical salaries	All other costs of service provision for each inpatient separation during the collection period, e.g. salaries and wages of patient care assistants.
Pathology	Costs of all diagnostic clinical laboratory testing for the diagnosis and treating of patients.
Imaging	Diagnostic and therapeutic imaging, produced under the direction of a qualified technician and reported by a medical practitioner.
Allied health	Clinical services which are delivered by qualified allied health professionals who have direct patient contact in areas including audiology, nutrition, occupational therapy, optometry, orthoptics, physiotherapy, podiatry, social work, psychology and speech pathology.
Pharmacy	Provision of pharmaceuticals, including the purchase, production, distribution, supply and storage of drug products and clinical pharmacy services.

Critical care	Costs incurred in the intensive care and coronary care units including salaries, pharmacy, goods and services, pathology, imaging and supplies.
Operating room	Costs incurred in the area of the hospital where significant surgical procedures are carried out in surgical conditions under the supervision of qualified medical practitioners.
Emergency departments	Costs incurred in the area of the hospital where patients who present in an unscheduled manner can be triaged, assessed and treated.
Ward supplies and other overheads	All costs attributed to wards that are not included in any other cost centres.
Specialist procedures suites	Costs for suites specifically equipped to provide an environment where diagnostic and therapeutic procedures can be performed under the direction of qualified medical practitioners.
Oncosts	Includes worker superannuation, termination payments, lump sum payments, fringe benefits tax, long service leave, workers' compensation and recruitment costs.
Prostheses	Costs of all prostheses acquired by the hospital (both on and off hospital accounts).
Hotel services	Comprises overhead costs such as cleaning services, linen and laundry services, food services, general hotel services and porters and orderlies.
Depreciation	Depreciation for items that are durable, able to support production for an appreciable period of time and purchased outright or donated.

Source: DoHA (2007).

To estimate differences in costs that vary between HITH care and hospital care, cost categories were grouped into fixed costs and costs expected to vary by hospital inpatient ALOS.

Fixed cost categories (hospital costs assumed to be independent of inpatient ALOS) included:

- pathology;
- imaging;
- pharmacy;
- critical care;
- operating room;
- emergency department;
- specialist procedure suites;
- prostheses;
- oncosts; and
- depreciation.

Fixed costs are independent of length of patient stay in hospital. Estimated fixed hospital costs per hospital separation in 2011 are presented in Table 3.4 by AR-DRG. Hospital costs in 2008-09 were converted to costs in 2011 using the average rate of health inflation.[3]

[3] Costs were inflated at 3.2% per annum, the average annual rate of health inflation between 1998-99 and 2008-09 (AIHW, 2010a).

Table 3.4: Fixed hospital costs per inpatient separation by AR-DRG 2011

AR-DRG name	AR-DRG code	Pathology	Imaging	Pharmacy	Critical care	Operating room	Emerg. dept	Specialist procedure suites	Prosthes.	Oncosts	Deprec.
		$ per hospital separation	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*	*$ per hospital separation*
Cellulitis	J64B	124.87	88.75	182.66	11.35	217.75	435.50	6.19	9.29	249.74	147.58
Venous thrombosis	F63B	163.28	188.09	196.35	21.70	17.57	444.38	8.27	2.07	173.62	65.11
Pulmonary embolus	E61B	260.06	384.94	231.17	200.21	17.54	625.39	16.51	8.26	259.03	106.30
Respiratory infection/ inflammation	E62C	173.43	122.84	123.88	30.97	26.84	503.76	6.19	3.10	204.39	78.45
COPD	E65B	175.56	119.79	209.64	40.28	34.08	550.44	21.69	4.13	265.41	97.08
Knee replacement	I04Z	232.22	187.84	281.77	164.11	4,034.52	13.42	3.10	6,840.83	596.56	285.89

Source: Deloitte Access Economics calculations using DoHA (2010) and AIHW (2010a).

Costs expected to vary by inpatient ALOS for all six DRGs were:

- ward nursing;
- non-clinical salaries;
- allied health;
- ward supplies and other overheads; and
- hotel services.

The salary costs of labour attending to inpatients (nurses, care assistants and allied health professionals) and ward supplies are both expected to increase with longer inpatient stays for all AR-DRGs. Hotel services costs such as cleaning and food services are also assumed to increase with longer inpatient stays.

Variable hospital costs were expressed as *per diem* costs by dividing hospital costs per separation by ALOS for each AR-DRG (Table 3.5).

Table 3.5: Estimated variable hospital costs per inpatient day by AR-DRG 2011

AR-DRG name	AR-DRG code	Ward nursing	Non-clinical salaries	Allied health	Ward supplies	Hotel services
		$ per hospital day	*$ per hospital day*	*$ per hospital day*	*$ per hospital day*	*$ per hospital day*
Cellulitis	J64B	371.30	101.54	14.94	124.23	40.12
Venous thrombosis	F63B	219.08	41.61	9.87	45.67	21.29
Pulmonary embolus	E61B	256.65	61.05	16.20	51.50	33.43
Respiratory infection/inflammation	E62C	340.28	73.92	24.53	72.64	43.33
COPD	E65B	301.25	69.70	31.95	75.72	43.30
Knee replacement	I04Z	409.05	68.52	66.04	77.85	60.94

Source: Deloitte Access Economics calculations using DoHA (2010) and AIHW (2010a).

Ward medical costs were assumed to vary by hospital length of stay for cellulitis, venous thrombosis, pulmonary embolus, respiratory infection/inflammation and COPD. All these AR-DRGs had relatively short ALOS in hospital with HITH care. Cellulitis, venous thrombosis and respiratory infection, for example, had hospital ALOS of 0.9, 0.6 and 1.0 days respectively (DLA Phillips Fox, 2010). It can be concluded that treatment of these AR-DRGs largely occurs at home in a HITH separation.

Furthermore, care at home for these AR-DRGs can be primarily nurse-led. For example, home infusion therapy for cellulitis, venous thrombosis and pulmonary embolus can be delivered through a nurse-led model and encompass limited clinical input from medical practitioners. The majority of home care for COPD is also nurse-led (DLA Phillips Fox, 2010). For these reasons, it was assumed that care for these conditions would involve a limited level of medical input during the hospital stay period and that ward medical costs would be dependent on ALOS in hospital.

In contrast, ward medical costs were assumed to be independent of hospital ALOS for knee replacements and to be the same for HITH care as they would be for care purely in the hospital. This is because, for this AR-DRG, HITH care would only encompass post-surgical orthopaedic care at home. All costs attached to the actual knee replacement procedure, including medical ward costs, would still be incurred for time in hospital.

Medical ward costs in 2011 by AR-DRG, which served as inputs to the cost minimisation analysis, are presented in Table 3.6.

Table 3.6: Ward medical costs by AR-DRG 2011

	Cellulitis	Venous thrombosis	Pulmonary embolus	Respiratory infect./ Inflamm.	COPD	Knee rep.
	$ per hospital day	*$ per hospital day*	*$ per hospital day*	*$ per hospital day*	*$ per hospital day*	*$ per hospital separation*
Cost	171.54	113.41	137.25	161.22	142.40	1,887.73

Source: Deloitte Access Economics calculations using DoHA (2010) and AIHW (2010a).

The total public hospital costs associated with a HITH care separation were calculated by multiplying variable per day costs by ALOS in hospital with HITH care (from Table 3.1) and then adding total fixed costs. Total hospital costs per HITH care separation are presented by AR-DRG in Table 3.7.

Table 3.7: Total public hospital costs per HITH separation 2011

AR-DRG name	AR-DRG code	Total public hospital costs
		$ per separation
Cellulitis	J64B	2,214.99
Venous thrombosis	F63B	1,550.99
Pulmonary embolus	E61B	3,221.56
Respiratory infection/ Inflammation	E62C	1,989.77
COPD	E65B	3,311.75
Knee replacement	I04Z	17,189.29

Source: Deloitte Access Economics calculations using DoHA (2010), DLA Phillips Fox (2010) and AIHW (2010A).

3.3.2 Time costs associated with nurse care at home

Time costs associated with nurse-provided care at home includes the cost of home visit time and the cost of time spent travelling.

Hours of care spent travelling and attending to patients at home were valued at the estimated hourly wage rate for registered nurses. A public sector enterprise bargaining agreement in Victoria requires that Division 1 registered nurses providing HITH care must be at level grade 3B or above under the Victorian registered nurse classification system (Department of Health Victoria, 2008). The average weekly rate of pay for grade 3B registered nurses in Victoria in December 2009 was $1,283.70 for nurses in their first year

and $1,301.10 for nurses in their second year (ANF, 2009). The average of the first and second year rates ($1,292.40) was inflated to 2011 by the public sector labour price index from December 2009 onwards (ABS, 2011) to estimate a weekly wage rate of $1,343.45. In 2009, average weekly working hours for a registered nurse were 33.6 hours (ANF, 2009). An average hourly rate of $39.98 was estimated by dividing the weekly rate by average working hours.

A study on HITH care in NSW (Shanahan et al, 2001) reported on the duration of total home visits by nurses per HITH separation across six pilot hospital sites. The combined visit data was for acute care HITH separations for conditions such as cellulitis, venous thrombosis, respiratory infections and post-operative care.

The average duration of a daily nurse visit at each site was derived by dividing total duration of visits by average home care days. Table 3.8 reports the average duration of total home visits, average length of home care (days), estimated daily duration of home visits and number of HITH separations occurring at each hospital site.

Table 3.8: Data on nurse home visits for HITH sites in NSW

Hospital site	Number of HITH separations	Average duration: total home visits	Average period in home care	Calculated average duration: daily home visit
	number	*minutes*	*days*	*minutes*
Albury	165	300	6.1	49
Bega	129	299	5.1	59
Broken Hill	174	475	7.4	64
Lismore	129	237	5.0	47
Moruya	246	382	4.3	89
Tweed Heads	220	163	4.6	35

Source: Deloitte Access Economics calculations using Shanahan et al (2001).

A weighted average daily home visit time was derived by weighting daily duration at each hospital site by the proportion of HITH care separations occurring at that site. The weighted average time for a daily nurse visit was estimated to be 59 minutes.

The average daily visit time of 59 minutes was applied to the average home care days for HITH separations by AR-DRG (from Table 3.1) to estimate total visit times. Total visit time was then valued at the derived nurse hourly wage rate of $39.98. Estimates of total time costs per HITH separation for nurse home visits are presented by AR-DRG in Table 3.9.

Nurse time spent travelling was estimated by assuming a 40 kilometre distance per day travelled by nurses for daily home visits. Admission criteria for HITH programs frequently include the stipulation that patients live within a reasonable distance from the hospital. An Australian survey of hospitals offering HITH found that a number of hospitals indicated geographic selection criteria of patients living within 20 to 25 kilometres away from hospital or within a 20 minute drive (Haas et al, 1999).

Table 3.9: Estimated time costs of nurse home visits per HITH separation 2011

AR-DRG name	AR-DRG code	Total home visit time	Time costs of home visits
		minutes per HITH separation	*$ per separation*
Cellulitis	J64B	359.3	239.43
Venous thrombosis	F63B	424.1	282.60
Pulmonary embolus	E61B	306.3	204.10
Respiratory infection/ Inflammation	E62C	500.7	333.63
COPD	E65B	494.8	329.71
Knee replacement	I04Z	435.9	290.45

Source: Deloitte Access Economics calculations using ABS (2011), ANF (2009), DLA Phillips Fox (2010) and Shanahan et al (2001).

The NSW Roads and Traffic Authority estimates that average travel speed on seven major Sydney road routes was 31 kilometres per hour during morning peak times and 42 kilometres per hour during afternoon peak times in 2010 (RTA, 2010). The average of these two speeds, 36.5 kilometres, was assumed to be the average travel speed of nurse transport to homes.

Assuming a daily distance of 40 kilometres for nurse home visits and an average travel speed of 36.5 kilometres per hour, it was estimated that nurses would spend approximately 66 minutes per day travelling for home visits. This estimate was multiplied by average home care days for HITH separations by AR-DRG to estimate total time travelled per HITH separation. Total travel time was then valued at the derived hourly wage rate for registered nurses of grade 3B to estimate total time costs. Estimates of the time costs of nurse travel per HITH separation are presented in Table 3.10 by AR-DRG.

Table 3.10: Estimated time costs of HITH nurse travel 2011[(a)]

AR-DRG name	AR-DRG code	Total nurse travel time	Time costs of nurse travel
		minutes per separation	*$ per separation*
Cellulitis	J64B	401.1	267.29
Venous thrombosis	F63B	473.4	315.49
Pulmonary embolus	E61B	341.9	227.85
Respiratory infection/ Inflammation	E62C	558.9	372.45
COPD	E65B	552.3	368.07
Knee replacement	I04Z	486.6	324.25

Note: (a) Assuming a distance of 40km travelled for each daily home visit.
Source: Deloitte Access Economics calculations using ABS (2011), ANF (2009), DLA Phillips Fox (2010), RTA (2010) and Shanahan et al (2001).

3.3.3 Travel expenses associated with nurse care at home

Travel costs associated with nurse care at home would include fuel costs and other car expenses. The Australian Taxation Office estimates a car expenses rate of 63 cents per kilometre travelled for an ordinary car with a small-sized engine (ATO, 2011). Assuming nurse transport would occur through a small-sized vehicle, this rate was applied to the assumed daily travel distance of 40 kilometres per home visit to estimate daily expenses of $25.20. Daily car expenses were multiplied by average home care days for HITH separations by AR-DRG to estimate total vehicle expenses per HITH separation. Estimates are presented in Table 3.11 by AR-DRG.

Table 3.11: Estimated travel expenses associated with nurse care at home[(a)]

AR-DRG name	AR-DRG code	Travel expenses
		$ per separation
Cellulitis	J64B	153.72
Venous thrombosis	F63B	181.44
Pulmonary embolus	E61B	131.04
Respiratory infection/ Inflammation	E62C	214.20
COPD	E65B	211.68
Knee replacement	I04Z	186.48

(a) Assuming a distance of 40km travelled for each daily home visit.
Source: Deloitte Access Economics calculations using ATO (2011).

3.3.4 Informal care costs

It is expected that HITH separations would encompass some level of informal care. Informal carers are people who provide care to others in need of assistance or support on an unpaid basis. Generally, informal care is provided by family or friends of the person receiving care.

Informal care is distinguished from services provided by people employed in the health and community sectors (formal care) because the care is generally provided free of charge and is not regulated by the government. While informal care is provided free of charge, it is not free in an economic sense, as time spent caring is time that cannot be directed to other activities such as paid work, unpaid work or leisure.

Due to lack of data on hours of informal care provided to HITH patients with the selected AR-DRGs, it was assumed that two hours of daily informal care would be provided during home care days for all AR-DRGs. Excluding knee replacements, the conditions under investigation generally allow people to maintain their independence around the home and within society. A relatively low level of daily informal care as therefore applied across conditions with subsequent analysis conducted around hours of daily informal care needed for equalise hospital care costs and HITH care costs for each condition (Section 3.4.2).

Total informal care hours for each HITH separation were calculated by multiplying two daily hours of informal care by the average number of home care days for HITH separations by AR-DRG. Informal care hours were valued under the opportunity cost method at the estimated average hourly wage rate for full-time workers in Australia. This rate was

estimated by dividing the average weekly full-time wage in Australia in 2009 ($1,219) by estimated full-time weekly hours and inflating to by the labour price index to convert to current day value (ABS, 2010; 2011). The average hourly wage rate was estimated to be $31.51.

Estimates of total informal care hours and informal care costs per HITH separation are presented by AR-DRG in Table 3.12.

Table 3.12: Informal care hours and costs per HITH separation 2011[(a)]

AR-DRG name	AR-DRG code	Estimated informal care hours	Informal care costs
		hours per separation	*$ per separation*
Cellulitis	J64B	12.2	384.44
Venous thrombosis	F63B	14.4	453.76
Pulmonary embolus	E61B	10.4	327.72
Respiratory infection/ Inflammation	E62C	17.0	535.69
COPD	E65B	16.8	529.39
Knee replacement	I04Z	14.8	466.37

(a) Assuming two hours of informal care per day in home care.
Source: Deloitte Access Economics calculations using ABS (2010; 2011) and an assumed estimate of two hours of informal care per day at home.

3.3.5 Cost of consumables used during home care

Consumables used during home care days would include pharmaceuticals, dressings, needs and diagnostic services (Shanahan et al, 2001). Since this cost minimisation analysis assumes equivalent clinical outcomes between a HITH care and hospital care separation, it is assumed that equivalent levels of consumables would apply to both.

However, there may be fewer pathology tests with HITH care as compared to hospital care. An Australian study of 100 acute medical patients and 228 elective surgical patients (Board et al, 2000a) found that 25% fewer laboratory tests were ordered with HITH care for acute medical patients and 75% fewer laboratory tests for elective surgical patients, as compared to hospital care.

While HITH care may reduce pathology service use, it is difficult to quantify the hospital resource savings that would result (Board et al, 2000). The pathology cost centre from DoHA data (Table 3.3) includes the cost of salaries/wages of those administering tests, and the cost of test supplies. While fewer pathology tests will reduce consumption of test supplies, it is unclear whether it would result in salary cost savings. Consequently, it was assumed in this report that the same pathology costs would apply to a HITH care separation and a hospital care separation.

Finally, pharmaceuticals and imaging and supplies associated with critical care, operating room, specialist procedures and prostheses are all hospital costs independent of the inpatient hospital length of stay. Thus, these costs are assumed to be the same for a hospital care separation and a HITH care separation.

3.3.6 Total costs of HITH care

The total costs of a HITH care separation were estimated by summing estimated public hospital costs, nurse time costs, travel expenses and informal care costs. Estimates are presented by AR-DRG in Table 3.13.

Knee replacements were estimated to be the most costly condition for HITH care at $18,457 per separation. This is because home care for knee replacements is primarily related to post-surgical care and full medical, surgical and prostheses hospital costs associated with the knee replacement procedure are still expected to be incurred. The least costly condition for HITH care was venous thrombosis at $2,784 per separation. From Victorian data, this condition had the shortest ALOS in hospital with HITH care of 0.6 days.

Table 3.13: Total costs per HITH care separation 2011

AR-DRG name	AR-DRG code	Public hospital costs	Nurse time: home visits	Nurse time: travel	Travel expense	Informal care	Total costs
		$ per separation	*$ per separation*	*$ per separation*	*$ per separation*	*$ per separation*	*$ per separation*
Cellulitis	J64B	2,215	239	267	154	384	3,260
Venous thrombosis	F63B	1,551	283	315	181	454	2,784
Pulmonary embolus	E61B	3,222	204	228	131	328	4,112
Respiratory infection/ inflammation	E62C	1,990	334	372	214	536	3,446
COPD	E65B	3,312	330	368	212	529	4,751
Knee replacement	I04Z	17,189	290	324	186	466	18,457

Source: Deloitte Access Economics calculations.

3.4 Results: comparison of costs

3.4.1 Total costs of HITH care versus hospital care

Total costs per hospital care separation were compared with total costs per HITH care separation for the six selected AR-DRGs. Ratios of the HITH care cost to hospital care cost are presented in the last column of Table 3.14.

Cost savings that apply to HITH care relative to hospital care are expected to depend on the degree to which HITH care reduces inpatient hospital stay, which varies across conditions. HITH care was found to be less costly than hospital care for all AR-DRGs except COPD where it was estimated to be 6% more expensive.

HITH care was estimated to increase the total treatment period for COPD by 149% (11.1 HITH care days compared to 4.5 hospital care days). Additionally, HITH for COPD was

estimated to result in the lowest hospital length of stay reduction (39%) per separation compared to hospital care of the six AR-DRGs examined (see Table 3.1). For these reasons, HITH care was found to be more costly than hospital care for COPD.

HITH care was found to be the least costly relative to hospital care for cellulitis (AR-DRG J64B) followed by venous thrombosis. This is due to a relatively large reduction in hospital length of stay with HITH care relative to hospital care alone, with an estimated 76% reduction for cellulitis and an 89% reduction for venous thrombosis.

HITH care costs per separation for knee replacements and respiratory infections were relatively close to hospital care only costs.

Table 3.14: Cost per HITH separation and cost per hospital separation from a societal perspective[(a)]

AR-DRG	AR-DRG code	HITH care costs	Hospital care costs	Difference (HITH - hospital)	Cost ratio (HITH/hospital)
		$ per separation	*$ per separation*	*$ per separation*	*%*
Cellulitis	J64B	3,260	4,546	-1,286	72
Venous thrombosis	F63B	2,784	3,688	-904	75
Pulmonary embolus	E61B	4,112	4,873	-761	84
Respiratory infection/ Inflammation	E62C	3,446	3,593	-147	96
COPD	E65B	4,751	4,481	270	106
Knee replacement	I04Z	18,457	19,359	-902	95

(a) Assuming two hours of informal care per day in home care.
Source: Deloitte Access Economics calculations.

A weighted average cost ratio across all AR-DRGs was calculated by weighting individual cost ratios by the proportions each AR-DRG contributed to total separations from all six AR-DRGs in Victoria in 2008-09 (DLA Phillips Fox, 2010). This was estimated to be 78%. Thus, on average, HITH care was estimated to cost 22% less than hospital care across all six AR-DRGs.

3.4.2 Analysis – impact of informal care hours on results

The results in Table 3.14 assume two hours of informal care per home care day. A low level of daily informal care was assumed on the premise that the selected AR-DRGs are not excessively disabling.

For all AR-DRGs, levels of daily informal care where HITH care costs would equal the costs of hospital care were estimated. These are presented in Table 3.15. Cellulitis, venous thrombosis and pulmonary embolus would all require relatively high hours of daily informal care for HITH care to cost the same as hospital care (8.7 hours, 6.0 hours and 6.6 hours,

respectively). For respiratory infections, HITH care would cost the same as hospital care at 2.6 daily hours of informal care.

For COPD, the total cost of a HITH care separation was found to exceed the total cost of a hospital care separation under the assumption of two daily hours of informal care in the initial analysis. Table 3.15 shows that with one hour daily informal care, HITH care for COPD would cost the same as hospital care.

Knee replacements may require a higher level of daily informal care than the assumed two hours in this study due to impacts on mobility. However, Table 3.15 shows that HITH care for this condition would still cost less than hospital care up until a level of 5.9 hours of daily informal care.

Table 3.15: Levels of daily informal care where HITH costs would equal hospital costs

AR-DRG	AR-DRG code	Daily informal care
		hours
Cellulitis	J64B	8.7
Venous thrombosis	F63B	6.0
Pulmonary embolus	E61B	6.6
Respiratory infection/ Inflammation	E62C	2.6
COPD	E65B	1.0
Knee replacement	I04Z	5.9

Source: Deloitte Access Economics calculations.

3.4.3 Cost comparison from a government perspective

Costs per hospital care separation were also compared to costs per HITH care separation from a government perspective (i.e. excluding estimated informal care costs). Ratios of the HITH care cost to hospital care cost are presented in the last column of Table 3.16.

The weighted average cost ratio under this perspective was 68%, weighting individual AR-DRG ratios by the proportion each AR-DRG contributed to total separations from all six AR-DRGs in Victoria in 2008-09 (DLA Phillips Fox, 2010). In terms of a government perspective, HITH was found to be cheaper relative to hospital care across all AR-DRGs.

Table 3.16: Cost per HITH and cost per hospital separation from government perspective[(a)]

AR-DRG	AR-DRG code	HITH care costs	Hospital care costs	Difference (HITH - hospital)	Cost ratio (HITH/hospital)
		$ per separation	*$per separation*	*$per separation*	*%*
Cellulitis	J64B	2,875	4,546	-1,671	63
Venous thrombosis	F63B	2,331	3,688	-1,357	63
Pulmonary embolus	E61B	3,785	4,873	-1,088	78
Respiratory infection/ Inflammation	E62C	2,910	3,593	-683	81
COPD	E65B	4,221	4,481	-260	94
Knee replacement	I04Z	17,990	19,359	-1,369	93

(a) Excludes the cost of informal care.
Source: Deloitte Access Economics calculations.

3.4.4 Limitations of analysis

This analysis attempts to compare the average costs of a HITH care separation with the average costs of a hospital care separation for six selected AR-DRGs. A cost-minimisation analysis was conducted assuming equivalent health outcomes for HITH and hospital care based on Cochrane reviews findings (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009). However, since these reviews did not specifically investigate findings for the six AR-DRGs chosen through meta-analyses, uncertainty exists around whether outcomes are truly equivalent with HITH care and hospital care for these AR-DRGs. Further investigation is needed to ascertain this.

Findings of cost savings with HITH care in this analysis are based on the assumption that HITH care results in a reduction in inpatient hospital stay and thus savings in hospital bed days. This assumption is supported by Victorian HITH data for selected AR-DRGs (Table 1.3 in Section 1.1.2). However, savings in bed days do not necessarily represent hospital cost savings if staffing levels are not adjusted to account for the change in bed days. This study assumes that nurse staffing levels can change in response to bed days and therefore ward nursing costs are assumed to be variable based on hospital length of stay.

Due to a lack of AR-DRG specific data in Australia on factors such as informal care with HITH and duration of nurse home visits, this analysis assumes the same estimates across AR-DRGs. No data was available to identify specific levels of daily informal care with HITH provided for the selected AR-DRGs. Thus, a daily level of two hours per home care day was assumed with analysis around levels required to make HITH care costs equal the costs of hospital care for each AR-DRG.

Additionally, Australian data on average public hospital costs per AR-DRG separation were used to cost inpatient hospital stay associated with HITH care and hospital costs. Average costs per separation are affected by hospital occupancy levels and utilisation rates (Board

et al, 2000). Additionally, for hospital costs assumed to vary with hospital length of stay, a constant per day cost was assumed over the entire hospital stay. Hospital costs per day tend to be higher towards the beginning of a hospital stay with concentrated resource use early in an inpatient admission (Board et al, 2000; Taheri et al, 2000). This analysis attempts to account for this by assuming some hospital cost categories are independent of hospital length of stay and the same amounts apply to inpatient stays associated with both HITH care and hospital care. For example, emergency department costs per separation are assumed to be incurred in full for HITH care separations. These costs comprise a significant resource component of the admission phase of HITH care (Board et al, 2000).

3.5 Potential cost savings from expanding HITH

Given that HITH separations were found to be less expensive per separation to government than a traditional hospital separation (see Section 3.4.3), an increase in HITH separations with a commensurate decrease in hospital separations has the potential to generate cost savings to federal and jurisdictional governments.

The potential cost savings to government from expanding HITH within the six selected AR-DRGs were calculated by:

- estimating the number of public HITH separations by jurisdiction and AR-DRG;
- estimating the number of additional HITH separations associated with a 10% increase in public HITH separations and multiplying by the expected cost savings to government per HITH separation; and
- estimating the number of additional HITH separations associated with switching all public hospital separations to HITH and multiplying by the expected cost savings to government per HITH separation.

The number of public hospital separations by jurisdiction and AR-DRG were estimated using data from the National Hospital Morbidity Database (NHMD) (AIHW, 2011) and the National Hospital Cost Data Collection (NHCDC) (DoHA 2010).[4] Results are presented in Table 3.17.

The number of HITH separations by AR-DRG for Victoria was estimated using data on the proportion of HITH separations to total separations (DLA Phillips Fox 2010). However, other jurisdictions have a lower proportion of HITH separations compared to Victoria (AIHW, 2010b), so applying Victorian estimates to other jurisdictions would overestimate the number of HITH separations. To account for differences, jurisdictional weightings were applied to Victorian data.[5] The estimated proportion of HITH separations by AR-DRG for all jurisdictions is presented in Table 3.18.

[4] Public hospital separations by AR-DRG in 2011 were estimated by growing the total number of hospital (public and private) separations sourced from the NHMD by the population growth rate, and splitting between public and private hospitals using the NHCDC. To obtain a split by jurisdiction, estimated public hospital separations were multiplied by the proportion of the Australian population living in each jurisdiction.

[5] Jurisdictional weightings were calculated by dividing the proportion of jurisdictional HITH separations by the proportion of Victorian HITH separations (AIHW, 2010b). As there were no data on the proportion of HITH separations to total separations for NSW and Tasmania, an Australian average was used.

To estimate public HITH separations in 2011, the estimated proportion of HITH separations by AR-DRG and jurisdiction were multiplied by the estimated number of public hospital separations. Results are presented in Table 3.19.

Table 3.17: Estimated public hospital separations by AR-DRG and jurisdiction, 2011

AR-DRG	NSW	VIC	SA	WA	ACT	QLD	TAS	NT	AUST
	'000	*'000*	*'000*	*'000*	*'000*	*'000*	*'000*	*'000*	*'000*
Cellulitis	13.88	10.67	3.14	4.44	0.69	8.70	0.97	0.44	42.93
Venous thrombosis	1.93	1.48	0.44	0.62	0.10	1.21	0.13	0.06	5.97
Pulmonary embolus	1.63	1.25	0.37	0.52	0.08	1.02	0.11	0.05	5.04
Respiratory infection	8.60	6.61	1.95	2.75	0.43	5.39	0.60	0.27	26.61
COPD	8.44	6.49	1.91	2.70	0.42	5.29	0.59	0.27	26.11
Knee replacement	3.66	2.81	0.83	1.17	0.18	2.29	0.26	0.12	11.32

Source: Deloitte Access Economics' calculations.

Table 3.18: Estimated proportion of public HITH separations by AR-DRG and jurisdiction

AR-DRG	NSW	VIC	SA	WA	ACT	QLD	TAS	NT	AUST
	%	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
Cellulitis	16.6	25.0	18.8	17.6	12.7	3.4	16.6	7.0	16.6
Venous thrombosis	38.5	58.0	43.7	40.7	29.4	7.8	38.5	16.3	38.5
Pulmonary embolus	17.9	27.0	20.3	19.0	13.7	3.7	17.9	7.6	17.9
Respiratory infection	2.0	3.0	2.3	2.1	1.5	0.4	2.0	0.8	2.0
COPD	1.3	2.0	1.5	1.4	1.0	0.3	1.3	0.6	1.3
Knee replacement	8.0	12.0	9.0	8.4	6.1	1.6	8.0	3.4	8.0
HITH weight	**0.66**	**1.0**	**0.75**	**0.70**	**0.51**	**0.14**	**0.66**	**0.28**	**0.66**

Source: Deloitte Access Economics' calculations.

Table 3.19: Estimated public HITH separations by AR-DRG and jurisdiction, 2011

AR-DRG	NSW	VIC	SA	WA	ACT	QLD	TAS	NT	AUST
	no.	*no.*	*no.*	*no.*	*no.*	*no.*	*no.*	*no.*	*no.*
Cellulitis	2,301	2,668	592	779	88	294	161	31	6,914
Venous thrombosis	742	861	191	251	28	95	52	10	2,231
Pulmonary embolus	292	338	75	99	11	37	20	4	877
Respiratory infection	171	198	44	58	7	22	12	2	514
COPD	112	130	29	38	4	14	8	2	336
Knee replacement	291	338	75	99	11	37	20	4	875

Source: Deloitte Access Economics' calculations.

3.5.2 Cost savings from a 10% increase in HITH separations

Differences in estimated costs between HITH separations and traditional hospital separations (see Section 3.4.3) were multiplied by a 10% increase in the estimated public HITH separations to determine potential cost savings to government from expanding HITH care.

A 10% in HITH care across the six AR-DRGs is estimated to result in cost savings to government of around $1.7 million in 2011 (see Table 3.20). The greatest potential cost saving was estimated to occur for Victoria given it has the highest intensity of HITH care. The greatest potential cost savings by AR-DRG were estimated to occur for cellulitis. This is because cellulitis has the greatest estimated cost savings per HITH separation relative to hospital care, and a 10% increase results in the greatest increase in HITH separations.

Table 3.20: Potential cost savings from increasing public HITH separations by 10%, 2011

AR-DRG	NSW	VIC	SA	WA	ACT	QLD	TAS	NT	AUST
	$'000	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*
Cellulitis	384.39	445.67	98.96	130.12	14.62	49.16	26.87	5.19	1,155
Venous thrombosis	100.81	116.88	25.95	34.13	3.84	12.89	7.05	1.36	303
Pulmonary embolus	31.76	36.82	8.18	10.75	1.21	4.06	2.22	0.43	95
Respiratory infection	11.69	13.56	3.01	3.96	0.44	1.50	0.82	0.16	35
COPD	2.91	3.37	0.75	0.98	0.11	0.37	0.20	0.04	9
Knee replace.	39.86	46.21	10.26	13.49	1.52	5.10	2.79	0.54	120
Total	**571.42**	**662.51**	**147.10**	**193.44**	**21.74**	**73.08**	**39.95**	**7.71**	**1,717**

Source: Deloitte Access Economics' calculations.

3.5.3 Cost savings from switching all separations to HITH

Switching all current public hospital separations to HITH care for each AR-DRG was estimated to result in cost savings to government of around $108.6 million (see Table 3.21). NSW has the greatest potential cost savings given it has the largest number of separations. Once again, cellulitis is expected to produce greatest cost savings among the selected AR-DRGs.

Table 3.21: Potential cost savings from switching all separations to HITH, 2011

AR-DRG	NSW	VIC	SA	WA	ACT	QLD	TAS	NT	AUST
	$'000	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*	*$'000*
Cellulitis	19,336	13,370	4,264	6,111	1,007	14,043	1,352	685	60,167
Venous thrombosis	1,612	846	334	497	92	1,514	113	70	5,078
Pulm. embolus	1,456	995	320	460	76	1,071	102	52	4,532
Respiratory infection	5,759	4,384	1,302	1,840	288	3,670	403	185	17,830
COPD	2,163	1,652	489	691	108	1,371	151	69	6,694
Knee replace.	4,609	3,389	1,032	1,466	234	3,089	322	154	14,295
Total	**34,934**	**24,637**	**7,742**	**11,065**	**1,804**	**24,758**	**2,442**	**1,215**	**108,596**

Source: Deloitte Access Economics' calculations.

Conclusions

No significant differences in mortality outcomes and hospital readmissions between HITH care and hospital care could be concluded from an analysis of past Cochrane reviews on early discharge and admission avoidance HITH (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009). However, these studies did find evidence of higher patient satisfaction with HITH care compared to hospital care across a range of different conditions with no consistent evidence of increased carer burden.

Based on the assumption of equivalent clinical outcomes for HITH care and hospital care, a cost minimisation analysis was conducted for six commonly occurring AR-DRGs in HITH services in Victoria which also consistently feature in peer-reviewed literature. These were cellulitis, venous thrombosis, pulmonary embolus, respiratory infection/inflammation, COPD and knee replacement.

Under an economy-wide perspective, HITH care was found to be less costly than hospital care for all AR-DRGs except COPD where it was estimated to be 6% more expensive. This is because relative cost savings applying to HITH care relative to hospital care are expected to depend on the degree to which HITH care reduces inpatient hospital stay and increases total treatment period, which varies across different conditions. From Victorian data (DLA Phillips Fox, 2010), HITH care relative to hospital care was estimated to result in the lowest hospital stay reduction per separation (39%) and the second largest increase in total treatment period (249%) for COPD, of the six AR-DRGs examined.

HITH care was found to be the cheapest relative to hospital care for cellulitis followed by venous thrombosis. This appears to be due to a high degree of reduction in hospital length of stay with HITH care relative to hospital care, with an estimated 76% reduction with cellulitis and 89% reduction with venous thrombosis.

On average, the analysis indicates that HITH care would cost 22% less than hospital care per separation across all six AR-DRGs. The baseline analysis was conducted assuming two hours of daily informal care applying to all AR-DRGs during home care days. A low level was assumed because the conditions under investigation generally allow people to maintain their independence around the home and within society, with the exception of knee replacements. Subsequent analysis indicates that HITH care for knee replacements would still cost less than hospital care up to a level of 5.9 daily hours of informal care.

From a government perspective (excluding the costs of informal care), HITH care was found to be cheaper relative to hospital care across all six AR-DRGs by 32% per separation on average.

Based on the results of the economic analysis and findings of higher patient satisfaction with HITH care across a range of conditions (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009), HITH appears to be a valuable option for consideration in future health care provision in Australia.

One indicator of health care system performance in Australia is responsiveness of care, which is defined as a service being client oriented, responsive to individual preferences with consumer participation in choices related to health care (AIHW, 2010b). If HITH care can

provide lower cost care than hospital while achieving equivalent or better clinical outcomes, it should be available as a choice for patients who are eligible based on findings of patient preference for HITH and higher patient satisfaction (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009).

Nonetheless, the costs of HITH care are likely to vary by condition and thus HITH care may be a lower cost, more appropriate substitute for hospital care for certain conditions as compared to others. Cost savings from HITH care relative to hospital care are likely to vary based on context, and will dependent on:

- perspective of a cost evaluation (e.g. health care provider, societal, government)
- condition being treated;
- appropriate patient selection criteria;
- appropriate patient discharge criteria;
- hospital level factors (e.g. patient throughput, clinical and organisational issues, scale); and
- geographic factors.

There are limitations with the economic analysis conducted in this report. A cost-minimisation analysis was conducted assuming equivalent health outcomes for HITH and hospital care based on Cochrane review findings (Shepperd and Iliffe, 2005; Shepperd et al, 2008; 2009). Uncertainty exists around whether outcomes are truly equivalent for the six AR-DRGs chosen as this may depend on the specific hospital and home care setting. Due to a lack of AR-DRG specific data in Australia on factors such as informal care and duration of nurse home visits with HITH, this analysis assumes the same estimates across AR-DRGs.

A constant per day cost was used to estimate variable costs of inpatient hospital stay in HITH and hospital separations. However, hospital costs per day tend to vary over a length of stay with costs higher towards the beginning of a hospital stay.

Finally, any expansion of HITH is expected to remove hospital staff from hospitals, which may result in an opportunity cost associated with reduced productivity. For example, removing nurses from hospitals to deliver HITH care may result in less expense for some separations (as found within this report), but it may also reduce the number of patients a nurse can care for within a day. This type of cost has not been included within this study, and needs to be taken into consideration if HITH were expanded. However, a large expansion of HITH could also generate additional benefits by freeing up public hospital beds and creating greater access to hospital care. These benefits have not been included in this report and also needs to be taken into consideration if HITH were expanded.

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