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TECHNICAL
REPORT

Preventing emergency readmissions to hospital

A scoping review

Ellen Nolte, Martin Roland, Susan Guthrie,
Laura Brereton

Prepared for the UK Department of Health (England)
within the Policy Research Programme (PRP) project
"An 'On-call' Facility for International Healthcare Comparisons"

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1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
Westbrook Centre, Milton Road, Cambridge CB4 1YG, United Kingdom
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Preface

This report aims to inform the development of emergency readmissions for use as a potential indicator within the NHS Outcomes Framework through addressing five broad aims:

(i) To review the evidence on emergency readmissions within 28 days of discharge from hospital, published from 2000

(ii) To provide a synopsis of work undertaken in a small sample of countries on current patterns of readmissions and the interpretation of observed patterns

(iii) To comment on the statistical properties of the indicator

(iv) To comment on the need for case mix adjustment of data on readmission rates

(v) To comment on the strengths and weaknesses of the indicator 'emergency readmissions within 28 days of discharge from hospital and how it may best be used to meet the needs of the NHS.

The report was prepared as part of the project 'An "On-call" Facility for International Healthcare Comparisons' funded by the Department of Health in England through its Policy Research Programme (grant no. 0510002). The project comprises a programme of work on international healthcare comparisons that provides intelligence on new developments in other countries, involving a network of experts in a range of countries in the Organisation for Economic Co-operation and Development (OECD) to inform health (care) policy development in England. For more information on the project please visit www.international-comparisons.org.uk.

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Ellen Nolte
RAND Europe
Westbrook Centre, Milton Road
Cambridge, CB4 1YG
Tel. +44 (1223) 353 329
enolte@rand.org

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Summary

1. In its 2010 White Paper 'Equity and excellence: liberating the NHS' the Coalition Government expressed a commitment to create a mechanism whereby the NHS in England is held accountable for improving healthcare outcomes. The proposed NHS Outcomes Framework comprises a set of national goals for outcomes in five domains; one domain, capturing effectiveness, is centred around 'Helping people to recover from episodes of ill health or following injury', and the Framework proposes using 'emergency readmissions within 28 days of discharge from hospital' as one of the indicators to measure progress in this domain.

2. Emergency readmission to hospital is frequently used as a proxy measure of avoidable adverse outcomes after initial or 'index' admission to hospital but its appropriateness as a quality or performance indicator has been questioned as other factors unrelated to the quality of care can affect the probability of readmission. There is a need to further understand the various factors that influence readmission rates and so enable assessment of the potential for preventability attributable to health and/or social care. There is a particular need to better understand the transferability of evidence produced elsewhere to the NHS context.

3. This report aims to contribute to this process by presenting a scoping review of the evidence and potential for use of 'emergency readmissions within 28 days of discharge from hospital' as an indicator within the NHS Outcomes Framework. It draws on a rapid review of evidence presented in systematic reviews that have been published in the past 18 months. The review is complemented by a synopsis of work in a small sample of countries designed to better understand current patterns of readmissions and the interpretation of observed patterns in four countries (England, the USA, Australia and the Netherlands), drawing on published evidence and consultation with experts in the field.

4. Sixteen published studies assessing avoidability of readmissions within 28 or 30 days suggest that between 5 percent and 59 percent of readmissions may be avoidable. The weighted average percentage of admissions avoidable in these studies was 20.6 percent. An alternative approach to producing an overall figure is to pool all studies carried out in the UK whatever the assessment period. This gives a figure of 15.6 percent of readmissions that could be avoided. It should be noted that these studies are highly heterogeneous, and previous authors have advised against producing a benchmark figure for the percentage of readmissions

that can be avoided. Instead, benchmarking against local best practice (eg the top quartile in a region) or assessment of improvements against a historical baseline of the same organisation(s) may be preferable. Nevertheless, if such a figure is required for policy purposes in England, based on the evidence reviewed here, about 15 percent up to 20 percent may be considered reasonable.

5. Methodologies based on lists of diagnoses which can be considered a priori avoidable can produce radically different figures of the proportion of avoidable readmissions, eg 70–80 percent. However the great limitation of such approaches is that they do not take (often complex) individual patient circumstances into account.

6. It would be possible to analyse the evidence in more detail to attempt to explain differences between the percentages assessed as avoidable in different studies. However, we believe that this is unlikely to be fruitful because of the wide range of healthcare systems in which these studies took place and because of large differences in study population characteristics and methodologies. Prospective studies are needed to assess the proportion of readmissions that are avoidable in the contemporary NHS.

7. The majority of published studies focus on clinical factors associated with readmission. Studies are needed of NHS organisational factors which are associated with readmission or might be altered to prevent readmission.

8. No single diagnostic group or set of conditions stand out as being responsible for a high proportion of readmissions. In general, readmissions appear commoner among sicker patients, eg those who have needed more complex procedures or who are discharged to nursing homes.

9. There is a belief, only moderately well substantiated in the literature, that readmissions following surgery are more likely to result from deficiencies in hospital care, whereas readmissions following medical problems are more likely to result from deficiencies in community care or inadequate discharge planning.

10. There is a question as to whether some types of condition should be excluded from assessment of rates of readmission. Areas for exclusion commonly discussed in the literature include mental health, cancer chemotherapy, obstetric care and end of life care. Opinion is divided on whether readmissions for mental health should be included. However for the last three (chemotherapy, obstetric care and end of life care), attempting to performance manage readmissions down could damage patient care.

11. The introduction of new performance indicators always has the potential to produce gaming. Observers from the USA cite experience which suggests hospitals might increase income by admitting less serious cases, thus simultaneously increasing their income and reducing their rate of readmission. There is also the possibility that there may be some shift in coding of admissions between 'emergency' and 'elective' depending on the incentives. If hospitals are performance managed on the basis of readmission rates, it would be reasonable to expect that some behaviour of this type would occur.

12. Some interventions designed to reduce readmission have been robustly assessed in randomised controlled trials. Promising interventions include structured discharge planning. Evidence of the effectiveness of post-discharge follow up (including telephone follow) remains mixed.

13. There are strong associations between rates of readmission in England and clinical factors including diagnosis, and socio-demographic factors including age and ethnicity. There are arguments for and against risk adjusting readmission rates prior to publication. There may be a case for not adjusting for socio-demographic characteristics (apart from age) in order not to mask inequalities in the delivery of care. At the same time, it will be important to risk adjust readmission rates for diagnosis and comorbidity if hospitals are to be fairly and validly compared. Data from the USA suggest that hospitals may vary substantially in the type of patient case-mix that they admit. We do not know if this is the case in the UK, but strong advice from our US informants is that readmission data should be adjusted for illness severity and comorbidity.

14. For most clinical conditions, an average hospital will not have sufficient admissions and readmissions to allow reliable estimation of avoidable readmission rates over one year. Diagnoses either need to be aggregated into larger groups (eg medical or surgical) or by providing rolling three-year averages (as done by NCQA in the USA). Further research examining sample sizes required to produce reliable figures would usefully inform the development of condition-specific rates.

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CHAPTER 1 Background

In its 2010 White Paper 'Equity and excellence: liberating the NHS' the Coalition Government expressed a commitment to create a mechanism whereby the NHS in England is held accountable for improving healthcare outcomes.[1] Its proposed NHS Outcomes Framework comprises a set of national goals for outcomes in five domains around effectiveness, patient experience and safety, involving the development of a total of 51 indicators, with corresponding data to be published in April 2012.[2] One domain, capturing effectiveness, is centred around 'Helping people to recover from episodes of ill health or following injury', and the Framework proposes using 'emergency readmissions within 28 days of discharge from hospital' as one of the indicators to measure progress in this domain.

Emergency readmission to hospital is frequently used as proxy measure of avoidable adverse outcomes after initial or 'index' admission to hospital.[3] The use of this indicator is usually justified because a high proportion of emergency readmissions should be preventable if the preceding care is adequate.[4] The appropriateness of this measure as a quality or performance indicator has, however, been questioned as other factors unrelated to the quality of care can affect the probability of readmission, including patient factors such as severity and chronicity of the underlying condition and levels of co-morbidity, as well as socio-demographic factors. So variation of emergency readmission rates between hospitals may be due to factors such as variation in population structure (ageing population, elderly living alone), variation among hospitals in case mix and condition severity, and issues such as random variation due to small numbers and problems in defining the denominator.

Mason et al. (2000) reviewed over 150 studies published between 1990 and 2000 to examine the usefulness of readmission rates as an indicator of clinical performance over time and as a method of comparing the performance of hospitals.[5] The review included an assessment of work that aimed to identify predictors and causes of readmission, the extent to which readmission rates reflect the quality of care, the extent to which readmission rates can or should be considered avoidable or preventable, as well as factors other than quality of care that influence readmission rates. The evidence reviewed provided mixed findings. For example, it identified one meta-analysis which suggested that poor quality of care was significantly associated with a higher risk of readmission[6], but this relationship varied for different groups of conditions.[5] Similarly, the evidence on the preventability of readmissions was mixed, with estimated proportions of readmissions among groups of older patients considered unavoidable ranging from 15 to 60 percent although the degree

of 'preventability' appeared to differ between conditions and in relation to occurrence (early versus later readmissions). The authors further highlighted the potential problem of false negatives whereby patients might have avoidable negative outcomes but are not readmitted, an issue that tends to be overlooked.

A review by Benbassat and Tagarin (2000) also considered the literature published during the 1990s.[7] It focused on the frequency of preventable readmissions, reported to range between 9 and 48 percent for readmissions occurring within one month to up to one year, and the efficacy of interventions aiming at their prevention. It concluded that most readmissions appear to be 'caused by unmodifiable causes, and that, pending an agreed-on method to adjust for confounders, global readmission rates are not a useful indicator of quality of care'. However, it also noted that high readmission rates of patients with conditions such as diabetes and bronchial asthma pointed to problems with the quality of care delivered.

If emergency readmissions rates are to be used as an indicator of progress on how well the health and social care system in England helps patients to recover, either from episodes of ill health or following injury, there is a need to further understand the various factors that influence readmission rates and therefore enable assessment of the potential for preventability that can be attributed to health and/or social care. One important issue is the place of case mix adjustment in producing comparative performance data: how important is adjustment and which variables should be included in risk adjusted models. There is a particular need to better understand the transferability of evidence produced elsewhere to the NHS context as the majority of empirical work on emergency readmissions has been undertaken in the USA, which differs substantially with regard to the governance, organisation and financing of healthcare.

1.1 Aims of this report

Against this background, this work seeks to inform the development of emergency readmissions for use as a potential indicator within the NHS Framework through addressing five broad aims:

- to review the evidence on emergency readmissions within 28 days of discharge from hospital, published from 2000 in order to complement the earlier review by Mason et al. (2000)[5]
- to provide a synopsis of work undertaken in a small sample of countries designed to better understand current patterns of readmissions and the interpretation of observed patterns and trends within the context of the relevant healthcare system
- to comment on the statistical properties of the indicator
- to comment on the need for case mix adjustment of data on readmission rates. How important is adjustment, and which variables should be included in risk adjusted models?

- to comment on the strengths and weaknesses of the indicator 'emergency readmissions within 28 days of discharge from hospital and how it may best be used to meet the needs of the NHS.

CHAPTER 2 Evidence review

We have undertaken a rapid evidence review to provide data, where available, on:

- the proportion and type of all emergency readmissions that are potentially avoidable (and, vice-versa, that are expected or inevitable)
- the extent to which emergency readmissions that are considered avoidable can be attributed to deficiencies in the original hospital care
- the extent to which emergency readmissions that are considered avoidable can be attributed to deficiencies in primary and community care or social care or both
- the proportion and type of emergency admissions that are potentially avoidable and can be attributed to factors other than health and social care (eg a high proportion of the variance in emergency admissions can be explained by socio-economic factors)
- the proportion and type of emergency admissions that are potentially avoidable by diagnostic group.

The rapid evidence review principally draws on systematic reviews published in the past 18 months to supplement earlier reviews. Systematic reviews considered for inclusion were identified by means of a search of the biomedical database PubMed, using the broad search term "readmissions" (title or abstract) and "review" (article type). We identified seven systematic reviews and one review not explicitly labelled as systematic, which we included for completeness. Studies were analysed using a common template, extracting information on stated study aim(s); databases searched and period covered; inclusion and exclusion criteria; number of original studies reviewed, and whether these were assessed for quality and how; populations studied; definition of readmission; and data on each of the points listed above, where available.

We further considered a recent overview of the peer-reviewed research evidence on avoidable admissions that also included systematic reviews of interventions to reduce readmissions.[8]

Recognising that reviews considered here are unlikely to have captured most recent evidence from empirical work on readmissions, we further undertook a review of primary studies published during 2010 and 2011. These were identified through searching PubMed using the broad terms "readmissions" (title or abstract) and "avoidable/preventable/reduce" (title or abstract) ('/' indicating 'or'). This additional search yielded 135 records. Titles and abstracts were screened for eligibility for inclusion. Studies

considered eligible were retrieved where possible and scrutinised further for inclusion or exclusion in the review. We generally excluded studies that did not examine readmissions within 28–30 days, considered frequency of readmissions only, or focused on newborn and paediatric populations or intensive care settings. We also excluded study protocols, commentaries, letters and editorials. Of the 135 records identified, 28 studies were considered eligible for inclusion. Of these, ten studies were intervention studies assessing the impact on readmission rates as the primary or secondary outcome. A further 18 studies were empirical studies of readmissions, of which nine focused on disease- or procedure-specific index-admissions. Of these 18 studies, only three examined preventability of readmission, 12 studies aimed at identifying risk factors for readmission without quantifying 'avoidability', and three investigated provider ability or tools to predict readmission.

We note that the analysis presented here constitutes a scoping review rather than a systematic assessment of all the available evidence, which was beyond the scope of this report. We now present an overview of the main characteristics of the eight reviews considered (Table 2.1); where appropriate and necessary, we also present findings from individual studies cited by systematic reviews in order to provide further insights that could not be extracted from the relevant review. We complement this by evidence from recent primary studies that have not been captured by the systematic reviews described here, where appropriate and relevant.

Table 2.1 Summary of key observations from systematic reviews of studies of avoidable readmissions

Source	Stated aim of review	Period covered	Databases searched	Inclusion criteria	Exclusion criteria	Studies reviewed	Quality assessment	Populations studied
García-Pérez et al. (2011)[9]	To identify the risk factors associated with unplanned hospital readmissions in patients aged 75 and older	Up to January 2010	EMBASE, MEDLINE, CINAHL, SCI, SSC, Indice Medico Espanol, LILACS, Google Scholar	Prospective cohort studies with appropriate statistical analysis	Language other than English or Spanish Retrospective, cross-sectional and qualitative design Patients with specific conditions More than 50 percent subjects are or average age is under age 75	12	CASP (Critical Appraisal Skills Programme) checklist for cohort studies Quality of statistical analysis based on Bagley et al. (2001)[10]	Admissions of patients aged 60 years and over (mean age of populations studied: 74+)
van Walraven et al. (2011a)[11]	To review studies that measure the proportion of readmissions deemed avoidable To examine how readmissions were measured and to estimate their prevalence	1966 to July 2010	Medline and Embase	Studies which included a population of hospital readmissions, or counted the number of readmissions classified as avoidable	Language other than English	34	Not stated	Medical (73.5 percent of studies), surgical (38.2 percent), geriatric (32.4 percent) Most studies included all readmissions; four were diagnosis specific

Source	Stated aim of review	Period covered	Databases searched	Inclusion criteria	Exclusion criteria	Studies reviewed	Quality assessment	Populations studied
Lichtman et al. (2010)[12]	To identify and evaluate existing statistical models to compare hospital-level poststroke readmission rates, and predict readmission To identify and evaluate consistency of patient-level and process-of-care predictors of readmission after stroke hospitalisation	January 1989 to July 2010	MEDLINE, Scopus, PsycINFO, ACP Journal Club, Cochrane Database, Database of Abstracts and Reviews of Effects, Cochrane Central Register of Controlled Trials	Reporting readmission within 1 year after stroke hospitalisation and on one or more predictors of readmission in risk-adjusted statistical models	Language other than English No primary data collection or quantitative outcome data Articles other than abstracts, reviews, letters, editorials, case series, case reports, experimental intervention studies Patient population n<100 Limited to TIA and/or haemorrhagic stroke patients or on patient disease subgroups (eg diabetes)	16	Not stated	Patients admitted for ischaemic stroke
Linertová et al. (2010)[13]	To identify interventions that effectively reduce the risk of hospital readmission for older patients To assess the role of home follow-up	To October 2007 (Medline: to October 2009)	EMBASE, MEDLINE, CINAHL, CENTRAL, CRD, SCI, SSCI, Indice Medico Espanol, LILACS, Google Scholar	Controlled trials of an intervention during admission or follow-up of older patients admitted for any medical problem measuring unplanned readmission as one outcome	Language other than English or Spanish Patients with specific conditions More than 50 percent subjects are or have an average age under age 75	32	SIGN (Scottish Intercollegiate Guideline Network) tool for clinical trials	Admissions of patients aged 60 years and over (mean age of populations studied: 74+) 17 in-hospital interventions and 15 interventions with home follow-up
Vest et al.	To determine the factors	January	Medline, ISI,	Research studies	Language other	37	Quality assessed	Conditions covered

Source	Stated aim of review	Period covered	Databases searched	Inclusion criteria	Exclusion criteria	Studies reviewed	Quality assessment	Populations studied
(2010)[14]	that are associated with preventable readmissions	2000 to December 2009	CINAHL, Cochrane library, ProQuest Health Management, PAIS International	examining unplanned, avoidable, preventable or early readmissions	than English Admissions other than psychiatric Admissions other than adult Country other than the USA Articles other than editorials, reviews, practice guidelines		on basis of (i) whether it conceptualised linkage between index admission and readmission (ii) methodological robustness (iii) use of multivariate statistics to control for patient confounding factors 9 studies met all three criteria	varied, sometimes focusing on (a wide range of) specific conditions, while others covered the patient population more generally Authors distinguish four groups: any or non-condition specific admissions, cardiovascular-related, other surgical procedures, all other conditions
Yam et al. (2010a)[15]	To review the literature on key components for measuring avoidable readmissions, assess the prevalence, associated risk factors and interventions to reduce potentially avoidable readmissions	To June 2010	Medline, PubMed, Cochrane Library	Original studies and review papers English language	Focus on early or emergency readmissions or other health outcomes Unclear definition of avoidable admission, methodology or programme description Articles other than commentaries and letters to editor	48	It is not stated how studies included in the review were analysed	Varied because of wide range of study designs analysed
Desai et al. (2009)[16]	To identify and evaluate any existing statistical models to compare hospital-specific rates of readmission for patients	To October 2007	MEDLINE, Scopus, PsycINFO, ACP Journal Club, Cochrane Database, Database of	Reporting on readmission within 1 year as a primary, secondary, or part of a composite	Language other than English No primary data collection or quantitative	35	Not stated	All-cause and cardiac-related readmissions

Source	Stated aim of review	Period covered	Databases searched	Inclusion criteria	Exclusion criteria	Studies reviewed	Quality assessment	Populations studied
	initially admitted for acute myocardial infarction, and to predict an individual's risk of readmission after discharge for AMI To identify and evaluate the consistency of published patient-level predictors of hospital readmission for patients with AMI		Abstracts and Reviews of Effects, Cochrane Central Register of Controlled Trials	outcome	outcome data Articles other than abstracts, reviews, letters, editorials, case series, case reports, experimental intervention studies Paediatric study Primary focus is on hospital- or physician-level characteristics			
Ross et al. (2008)[17]	To describe statistical models designed to compare hospital readmission rates for patients admitted for heart failure, and predict patients' risk of readmission among patients admitted for heart failure To identify patient characteristics associated with hospital readmission for patients admitted for heart failure	To 19 November 2007	MEDLINE, Scopus, PsycINFO, ACP Journal Club, Cochrane Database, Database of Abstracts and Reviews of Effects, Cochrane Central Register of Controlled Trials	Reporting on readmission among patients hospitalised for heart failure as primary or secondary outcome or part of a composite outcome	Language other than English No primary data collection or quantitative outcome data Articles other than abstracts, reviews, letters, editorials, case series, case reports, experimental intervention studies Paediatric study	117	Not stated	Patients admitted for heart failure

2.1 Proportion and type of all emergency readmissions that are potentially avoidable

One of the main challenges is the heterogeneity of studies examining readmissions. For example, in a systematic review of 37 research studies of unplanned, avoidable, preventable, or early readmissions, Vest et al. (2010) sought to identify factors associated with preventable readmission, conceptualised as an 'unintended and undesired subsequent post-discharge hospitalisation, where the probability is subject to the influence of multiple factors'.[14] Focusing on work undertaken in the USA only, the review observed considerable variation across studies in the definition of 'preventable' or 'avoidable' as well as timeframes for readmission (between seven days for unplanned readmissions related to cancer to five years for unplanned readmissions related to traumatic brain injury) (Table 2.2).

Two core questions arise from the range of definitions used in relation to readmissions:

1. What time period should be used?
2. Which diagnoses should be included?

Table 2.2 Overview of terms and timeframes used in studies of readmissions

Term	Index condition	Readmission condition	Timeframe	Source*
Early	Acutely decompensated heart failure	Heart failure or other cardiac cause	90 days	[a]
Early	Any condition	Any condition	30 days	[b,c]
Early	Any condition	Any condition	41 days	[d]
Early	Any condition	Any nonelective readmission	60 days	[e]
Early	Coronary artery bypass grafting (CABG)	Likely to be complications of CABG surgery	30 days	[f]
Early	Coronary artery bypass grafting surgery	Any condition	30 days	[g]
Early	Congestive heart failure	Congestive heart failure exacerbation admission	30 days	[h]
Early	Congestive heart failure	Congestive heart failure	180 days	[j]
Early	Elective laparoscopic colon and rectal surgery	Any condition	30 days	[k]
Early	Heart failure	Heart failure	30 days	[l]
Early	Heart failure and shock	Any condition or heart failure	30 days	[m]
Early	Ileal pouch-anal anastomosis surgery	Any emergency or elective, unplanned readmission	30 days	[n]
Early	Multiple chronic illnesses	Any condition	3 to 4 months	[o]
Early	Pancreatic resection	Any condition	30 days and 1 year	[p]

Term	Index condition	Readmission condition	Timeframe	Source*
Early	Pulmonary embolism	Any condition and complications of pulmonary embolism	30 days	[q]
Early unplanned	Cardiac surgery	Any condition	30 days	[r]
Late unplanned	Pneumonia	Pneumonia	30 days to 1 year	[s]
Non-elective and unplanned	Congestive heart failure	Same diagnosis-related group (DRG) as index admission	30 days	[t]
Potentially avoidable	Acute myocardial infarction	Acute myocardial infarction-related admissions	56 days to 3 years	[u]
Potentially preventable	1st diagnosis of diabetes or 2nd diabetes diagnosis among high risk conditions	Diabetes-related	30 and 180 days	[v]
Potentially preventable	AHRQ's prevention quality indicators ¥	AHRQ's prevention quality indicators	6 months	[x]
Potentially preventable	Any condition	Clinically related to index admission	7, 15 and 30 days	[y]
Readmissions due to early infection	Surgery	Infection	14 to 28 days	[z]
Shortly after discharge	Heart failure	Any condition	30 days	[aa]
Short-term	Any surgical procedure	Venous thrombo-embolism	30 days	[bb]
Unexpected early	Intestinal operations	Any condition (excluding planned)	30 days	[cc]
Unplanned	Abdominal or perineal colon resection	Related to the primary surgical procedure	90 days	[dd]
Unplanned	Any acute, short-stay admission	Any unexpected admission	30 days	[ee]
Unplanned	Any condition	Any condition	Up to 39 days	[ff]
Unplanned	Any condition	Any condition	31 days	[gg]
Unplanned	Any non-maternal, substance abuse or against medical advice discharge	Emergency or urgent admissions	30 days	[hh]
Unplanned	Cancer	Any unplanned	7 days	[jj]
Unplanned	Cardiac surgery	Related to complications of cardiac surgery	30 days and 6 months	[kk]
Unplanned related	Ileal pouch-anal anastomosis surgery	Admission resulted from a complication	30 days	[ll]
Unplanned, non-elective	Traumatic brain injury	Any non-elective or unplanned reason	1 and 5 years	[mm]
Unplanned, undesirable readmissions	Diabetes	Any non-elective	30 days	[nn]

NOTE: * Hyperlinked to PubMed abstract; ¥ AHRQ, Agency for Healthcare Research and Quality
SOURCE: adapted from Vest et al. (2010)[14]

There appears to be an assumption that readmissions over short periods of time (eg seven days) may reflect the quality of care provided in hospital while longer timeframes (eg 90 days) reflect community care. The proposed 28-day indicator for the NHS probably

reflects a balance between hospital and community care, and is a reasonable time period in the context in which the indicator will be used. Two major US organisations which are currently rolling out readmission indicators (the National Committee for Quality Assurance (NCQA) and Centers for Medicare & Medicaid Services (CMS)) are using similar time periods (30 days in both cases).[18-19]

The question of which diagnoses should be included breaks down into two parts – whether some diagnostic groups should be excluded all together, and whether individual diagnoses should be grouped. We discuss both these issues in later sections of the report.

2.1.1 Proportion of readmissions assessed as 'avoidable'

A systematic review by van Walraven et al. (2011a) examined 34 studies that measured the proportion of readmissions considered avoidable (defined by varying readmission time periods up to one year).[11] The authors noted considerable variation across studies included in the review, with the (unweighted) proportion considered avoidable ranging from 5 percent to 78.9 percent. The results of the studies included in the meta-analysis conducted by van Walraven and colleagues are reproduced in Table 2.3.

However, the figures presented relate to different readmission timeframes, between 14 days up to 12 months. When focusing specifically on the 16 of the 34 studies that analysed 28- or 30-day readmission rates, we find that the proportion judged avoidable ranged from 5.0 percent to 59 percent. Further details of these 16 studies are given in Table 2.4. In four cases, figures on readmissions and/or the proportion of readmissions deemed avoidable as presented in Table 2.4 divert from those given in Table 2.3. In three cases,[20-22] these differences reflect differences in the timeframe considered by van Walraven et al. (2011a).[11] In one case,[23] our interpretation of the study findings differs from that by van Walraven et al. (2011a); we have indicated the nature of these differences in the table.

Table 2.3 Overview of studies included in the systematic review and meta-analysis by van Walraven et al. (2011a), which included data on the proportion of readmissions that could be avoided

Study	Index admissions	Readmissions	Proportion of index admissions (%)	Readmissions deemed avoidable (%)	
Graham & Livesley (1983)	-	153	-	73	47.7
Popplewell et al. (1984)	978	73	7.5	13	17.8
MacDowell et al. (1985)	-	78	-	4	5.1
McInness et al. (1988)	-	153	-	46	30.1
Williams & Fitton (1988)	-	133	-	78	58.6
Clarke (1990)	-	74	-	21	28.4
Vinson et al. (1990)	140	66	47.1	35	53.0
Frankl et al. (1991)	2,626	318	12.1	28	8.8
Kelly et al. (1992)	-	211	-	33	15.6
Gautam et al. (1996)	713	109	15.3	16	14.7
Haines-Wood et al. (1996)	84	45	53.6	4	8.9

Study	Index admissions	Readmissions	Proportion of index admissions (%)	Readmissions deemed avoidable (%)	
Oddone et al. (1996)	1,262	811	64.3	277	34.2
McKay et al. (1997)	3,705	289	7.8	61	21.1
Experton er al. (1999)	190	48	25.3	37	77.1
Kwok et al. (1999)	1,204	455	37.8	35	7.7
Miles & Lowe (1999)	-	437	-	24	5.5
Levy et al. (2000)	2,484	262	10.5	13	5.0
Madigan et al. (2001)	114	31	27.2	8	25.8
Halfon et al. (2002)	3,474	1,115	32.1	59	5.3
Munshi et al. (2002)	3,706	179	4.8	70	39.1
Sutton (2002)	-	297	-	58	19.5
Courtney et al. (2003)	1,914	52	2.7	11	21.2
Friedman & Basu (2004)	345,651	122,015	35.3	67,108	55.0
Jiminez-Puente et al. (2004)	-	363	-	69	19.0
Maurer & Ballmer (2004)	773	151	19.5	10	6.6
Halfon et al. (2006)	-	494	-	390	78.9
Kirk et al. (2006)	1,289	77	6.0	22	28.6
Balla et al. (2008)	1,913	271	14.2	90	33.2
Goldfield et al. (2008)	3,501,142	409,759	11.7	242,991	59.3
Ruiz et al. (2008)	-	81	-	28	34.6
Stanley et al. (2008)	-	141	-	85	60.3
Witherington et al. (2008)	-	108	-	25	23.1
Phelan et al. (2009)	-	39	-	15	38.5
Shalchi et al. (2009)	-	63	-	45	71.4

SOURCE: adapted from van Walveren et al. (2011a)[11]

Table 2.4 Summary of studies reporting proportion of 28 or 30 day readmissions that are potentially avoidable as reviewed by van Walraven et al. (2011a)

Study	Year	Number of readmissions	percent readmissions deemed avoidable [n]	Population studied	Criteria for 'avoidability' of readmission	Notes on study
Balla et al. (2008)[24]	n/a	271	33.2 [90]	Sample of medical admissions to one medical centre Israel	2 reviewers Quality of care deemed poor because of incorrect action (erroneous drug, dose or both; diagnostic error; unnecessary test, procedure or drug) or inaction (early discharge; inadequate work-up; disregard of significant test result; failure to treat problem or monitor drug levels)	Commonest predictors for readmission were incomplete work-up, short hospital stay, inappropriate medication and diagnostic error
Clarke (1990)[20]	7/1987-6/1988	74 (263 assessments)	6.3 [5] (general medical, geriatric patients) 19.0 [14] (surgical patients)	Sample of general medical, geriatric and surgical admissions One London district, UK	2-4 independent assessors Recurrence or continuation of disorder leading to first admission; or recognised avoidable complication; readmission for social or psychological reason within control of hospital services	Readmission period considered: 21-27 days; proportion avoidable based on number of assessments of 74 cases notes (n=263) *Van Walraven et al. considered two periods (0-6 d and 21-27 d) together, so arriving at different figures for percent readmissions deemed avoidable*
Courtney et al. (2003)[25]	4/2000-6/2000	52	21.2 [11]	General surgical readmissions to one hospital within 3-month period Hull, UK	1 reviewer Avoidability criteria not reported	Preventable factors were mostly attributed to deficiencies in hospital care
Frankl et al. (1991)[26]	1986/87	318	8.6 [28]	All readmissions to medical department within 4 month period Boston, USA	3 reviewers Avoidability criteria not reported	Readmissions considered potentially preventable related to medical system failures (1/3), lack of patient improvement after discharge (1/3), other suboptimal judgements in evaluation or treatment (1/3)
Gautam et al. (1996)[27]	8/1994-1/1995	109	14.7 [16]	All readmissions of geriatric unit discharges to any local hospital Aberdeen, Scotland	3 reviewers Cases deemed avoidable by either GP or consultant, or both, further reviewed by study audit team	Number of cases deemed potentially avoidable by GP and/or consultant was 34 (= 31.2 percent of readmissions); main area of improvement identified as pre-discharge assessment of home circumstances

Study	Year	Number of readmissions	percent readmissions deemed avoidable [n]	Population studied	Criteria for 'avoidability' of readmission	Notes on study
Halfon et al. (2002)[21]	1997	174	23 [40]	Random samples of all admissions in one canton Canton Vaud, Switzerland	1 reviewer (20 percent of cases assessed by second reviewer) Complication following surgical intervention or another form of care; drug-related adverse event; premature discharge; discharge with a missing or erroneous diagnosis or inadequate treatment, other inadequate discharge; failed follow-up care	Readmissions differentiated into foreseen (eg chemo- and radiotherapy, treatment follow-up); unforeseen caused by a new affection; and unforeseen related to a previously known affection (ie potentially avoidable) *Van Walraven et al. considered 12-month period so arriving at different figures for percentage of readmissions deemed avoidable*
Halfon et al. (2006)[23]	2000	390	26.7 [104]	Random sample of 570 admissions to 12 acute hospitals within one year Switzerland	1 reviewer Complication following surgical intervention or another form of care; drug-related adverse event; premature discharge; discharge with a missing or erroneous diagnosis or inadequate treatment, other inadequate discharge; failed follow-up care	Study used computerised screening algorithm to identify potentially avoidable readmissions from administrative data and subsequently reviewed; predictive value of screening algorithm was 78 percent *Screening algorithm identified 494 'potentially avoidable readmissions' of which 390 were considered 'actual potentially avoidable readmissions' leading to predictive value of 78 percent (the figure also given by van Walraven). However, of these only 104 cases were identified as 'clearly avoidable' on case review, giving the rate of 26.7 percent rather than 78.9 percent as given by van Walraven et al.*
Kirk et al. (2006)[28]	Not reported	77	28.6 [22]	Acute medical admissions to one district general hospital within 5-week period Rotherham, UK	1 reviewer Clinician judgement as to appropriateness of discharge and avoidability of readmission (knowledge of patients' and carers' views collected through interviews)	Patients and carers were interviewed and asked about avoidability of readmission with patients believing this to be in 25.6 percent of cases (n=20) (carers: 31.2 percent [n=24]); commonest reason for 'avoidability' of readmission by patients and carers: wish to stay longer in hospital during the first admission or to have had greater support in the community after discharge

Study	Year	Number of readmissions	percent readmissions deemed avoidable [n]	Population studied	Criteria for 'avoidability' of readmission	Notes on study
Levy et al. (2000)[29]	n/a	262	5.0 [13]	Emergency medical admissions within 12-month period UK	1 reviewer Consultant judgement based on review of medical notes	Readmission rates were higher for smokers, men and people living in hostels
Maurer and Ballmer (2004)[22]	March–May 1998	32 (defined as unplanned readmissions; 34 percent of all readmissions within 30 days)	9.4 [3]	All patients admitted to internal medicine department during 3-month period One hospital, Switzerland	1 reviewer Recurrence or continuation of disorder leading to first admission; recognised avoidable complication; readmission for social or psychological reason within control of hospital services	Authors calculate percent of avoidable readmissions within 30 days (n=3) in relation to total discharge (n=773) so arriving at 0.4 percent potentially avoidable readmissions; when related to all unplanned readmissions within 30 days (n=32) the proportion potentially avoidable is 9.4 percent *Van Walraven et al. considered 3-month period so arriving at different figures for percent of readmission deemed avoidable*
McKay et al. (1997)[30]	n/a	289	21.1 [61]	Readmissions during a 3-month period Single US teaching hospital	1 reviewer Avoidability criteria not reported	
Miles and Lowe (1999)[31]	October 1998	437	5.5 [24]	All readmissions to one hospital within one month Newcastle, Australia	1 reviewer Poor or inappropriate clinical care (≥ 4 on 6-point scale), and preventability rated at least "more likely than not" (≥ 4/6)	Preventable readmissions identified as 'adverse events' (unplanned readmissions) (n=24) due to inappropriate medical management; preventability considered 'technically' possible but as 'extremely difficult cases so better outcomes might not have been possible
Munshi et al. (2002)[32]	n/a	179	39.1 [70]	Patients aged 65+ Teaching hospital Leicester, UK	3 reviewers Medical or social problem identified at index admission but not completely addressed; or complication of treatment	
Sutton et al. (2002)[33]	Februar y–	297	19.5 [58]	All surgical readmissions within	2 independent reviewers Avoidability criteria not reported	Only 2 percent of 'true' readmissions (unplanned readmission) were considered as

Study	Year	Number of readmissions	percent readmissions deemed avoidable [n]	Population studied	Criteria for 'avoidability' of readmission	Notes on study
	August 2000			health authority during 6-month period Leicestershire, UK	(readmissions were judged to be preventable, non-preventable and possibly preventable)	completely preventable, 14 percent as 'possibly preventable'
Williams and Fitton (1988)[34]	April 1984 to March 1985	133	58.6 [78]	Random sample of patients aged 65+ with unplanned readmission to one hospital Nottingham, UK	One reviewer Readmission avoidable with better preparation and timing of discharge; help for carer; communication with GP; nursing and social services support; medication management	Main reasons for readmission: carer problems and early discharge
Witherington et al. (2008)[35]	1 January to 13 Februar y 2004	108	23.1 [25]	Readmissions of consecutive patients aged 75+ to within 6 weeks to one teaching hospital Nottingham, UK	2 reviewers Readmission related to drug-related morbidity (DRM) preceded by a recognisable drug therapy problem which should have been foreseen; cause of DRM would have been identifiable with reasonable probability; cause of the DRM could have been reasonably controllable within the context and objectives of therapy	Study focus on readmissions caused by or related to communication gaps at hospital discharge and on assessing the contribution of incomplete discharge information to readmission

Studies reviewed by van Walraven et al. (2011a)[11] typically involved clinician review of medical records in some form to decide whether individual admissions could have been avoided. Different methodologies can produce different results. Thus, the study by Goldfield et al. (2008), which was also included in the analysis by van Walraven et al. (2011a),[11] reported two-week readmission rates using claims data for over four million admissions to 234 hospitals in Florida and relating potentially preventable readmissions (PPR) to 'candidate' admissions.[36] These were identified on the basis of the diagnostic code of the admission as a condition that was potentially avoidable rather than by examination of individual cases. Using the concept of readmission chains, which brings together all readmissions that are clinically related to the same initial admission, they estimated 'PPR chains' as a proportion of candidate admissions, which, for a 30-day period, were reported to be 11.0 percent. The meta-analysis by van Walraven and colleagues (2011a),[11] however, conceptualised the figures presented by Goldfield et al. (2008)[36] differently by relating the PPR chains to all readmissions within 15 days, so arriving at a proportion of preventable admissions of 59.3 percent. It is difficult, from the figures presented in either study, to calculate respective rates for 30-day readmissions; however, this complexity highlights some of the challenges related to the interpretation of what is considered 'avoidable readmission' (see also Table 2.4).

Against this background, we briefly examined studies reviewed by van Walraven et al. (2011a)[11] with particularly low and high rates of 'avoidability'. Both groups of study appeared to cover a range of types of admission and patient group. It would be possible to analyse these studies (and those from other reviews) to attempt to explain differences between the percentages assessed as avoidable. However, we believe that this is unlikely to be fruitful because of the wide range of patient groups assessed and healthcare system contexts in which these studies were carried out.

Furthermore, most of the studies included in van Walraven and co-workers' analysis (2011a) were based on data from single teaching hospitals and considered all readmissions (independent of diagnosis).[11] Overall, the analysis found the teaching status of hospital, whether all diagnoses or only some were considered, and length of follow-up to be significantly associated with the proportion of readmissions deemed avoidable. However, studies varied in their definition of what was considered 'avoidable' as noted earlier, typically using subjective criteria, based on the judgement of one reviewer. Where studies evaluated the reliability of assessment of avoidability, they showed considerable variation in these assessments.[7] For example, Gautam et al. (1996) found that two different groups analysing the same set of readmissions judged the proportions of them to be preventable as respectively 31.2 percent (as assessed by GPs and consultants by means of a questionnaire) and 14.7 percent (as assessed by the audit team).[27] Similarly, Oddone et al. (1996) noted in their study that the level of agreement between evaluators was only moderate (73 percent; kappa=0.43).[37] Inter-observer agreement between two senior clinicians on the preventability of readmissions within 30 days following discharge was rated somewhat higher in an analysis by Balla and colleagues (2008) (83 percent; kappa=0.67).[24]

Evidence assessed in other systematic reviews support the notion of the complexity associated with interpreting avoidable readmissions. For example, Yam et al. (2010a) examined 48 studies that aimed to identify the key components of avoidable readmissions, their prevalence, risk factors and interventions that can reduce potentially avoidable

readmissions.[15] Similar to van Walraven et al. (2011a)[11] the review reported considerable variation among studies relating to terminology, approaches to data collection and analysis. Based on seven studies, the review identified the proportion of all readmissions that were assessed as 'preventable' to vary from 9 percent to 59 percent. Of these, three explored readmissions within one month of discharge and the proportion of readmissions considered preventable varied from 15 percent to 23 percent. The review lacks detail regarding study selection and methods used for data extraction and analysis so findings have to be interpreted with caution.

This variation in relation to definitions and terminology, alongside differences in data collection and analysis, appears to persist in the most recent work on avoidable readmissions. Table 2.5 provides an overview of key observations of three primary studies that have examined 30-day readmissions that are potentially avoidable. Similar to observations drawn by the reviews by van Walraven et al. (2011a)[11] and Yam et al. (2010a)[15], the proportion of readmissions deemed to be avoidable varied widely, from 4.7 percent to 40.8 percent.

Table 2.5 Summary of studies reporting proportion of 28- or 30-day readmissions that is potentially avoidable published in 2010 and 2011

Study	Year	Readmissions	Readmissions deemed avoidable (%) [n]	Population studied	Criteria for 'avoidability' of readmission	Notes on study
Yam et al. (2010b)[38]	2007	603	40.8 [246]	Stratified random sample of patients with unplanned readmission to medical unity of all hospitals Hong Kong	Eight reviewers (physicians) Quality assessment checklist including checklist of preventability of readmission following Oddone et al. (1996)[37] and based on assessment of the principal factor as avoidable or not avoidable (system, clinician, patient or social factors)	'Clinician factors' (largely related to admission threshold discharge) and 'patient factors' (mostly relapse of previous complaint) explained the majority of readmissions considered 'avoidable', at 42.3 percent and 41.9 percent Concordance of principal diagnosis for admission and readmission and shorter time between discharge and readmission were associated with avoidable readmissions
Cakir and Gammon (2010)[39]	2008	85 (same-diagnosis-related readmissions only)	4.7 [4]	Patients rehospitalised to one community hospital with the same diagnosis within 30 days over period of one year (n=5,206) Gastonia, North Carolina, USA	3 reviewers Readmission judged to be preventable if the medication reconciliation documentation at discharge was not done correctly, a vital test which could have changed the treatment was ordered as an outpatient following discharge, or if the patient was not instructed to see his or her primary care physician or treating specialist for follow up	The authors concluded that 'patient education, family involvement in discharge process, and scheduling follow-up appointments could potentially reduce readmissions, despite multiple unmodifiable factors' although they did quantify the contribution of each of these factors to the preventability of readmission
Van Walraven et al. (2011b)[40]	October 2002 to July 2006	649 (over 6 months)	21.9 [n/a, study does not provide information of number of readmissions within 30 days] (over 6 months: 16 percent [104])	Review of all urgent readmissions that occurred within six months among patients discharged from 11 teaching and community hospitals (n=4,812 patients in final sample) 5 cities in Ontario, Canada	35 physicians (4 per readmission; 47 readmissions reviewed by 30 physicians) Six-point ordinal scale to rate whether readmission was an adverse event (poor clinical outcome due to medical care) and could have been avoided; contributing factors: medication, procedures, nosocomial infection, diagnostic error, management error, system error, surgical complication, other	Proportion of readmissions of all discharges deemed avoidable did not vary significantly among hospitals (1.2–3.7 percent, n.s.) while the proportion of avoidable readmissions of all readmissions ranged from 8.0 percent to 39 percent) Proportion of patients with urgent readmission was not associated with proportion of patients with an avoidable readmission

Based on the findings of their review, further supported by recent evidence, van Walraven et al. (2011a) concluded that the proportion of hospital readmissions that can be prevented has yet to be reliably determined.[11] However, we are aware of the policy priority to identify an overall 'percentage avoidable'.

We therefore first examined the data on 28–30-day readmissions as presented in Table 2.4 in order to see whether there was consistency in the proportion of readmissions deemed avoidable. As shown, the proportions of readmissions within 28 or 30 days assessed as avoidable range from 5 percent to 59 percent in 16 studies. In five of these studies, avoidable readmissions constitute at least one-quarter of all readmissions,[23-24 28 32 34] whereas in the remaining 11 studies the proportion rated as avoidable ranged from 5 percent to 23.1 percent. The mean percentage rated as avoidable for all 16 studies was 20.6 percent (662 out of 3211 readmissions). However, it is important to note that these studies are very heterogeneous, undertaken in a range of countries and settings. Furthermore, as indicated in Table 2.4, not only does the interpretation of 'avoidability' vary substantially across studies, but so does the definition of the actual denominator as the basis for calculating the proportion of readmissions deemed avoidable.

An alternative approach to arriving at an overall figure on avoidable readmissions is to aggregate all the studies from a given country, without consideration of the different timescale for measuring readmissions. In doing so, van Walraven et al. (2011a) estimated this figure for the UK to be 15.6 percent.[11] If the Department of Health requires an overall figure on the percentage of admissions to be considered as avoidable, we would assume, based on the evidence presented here, that about 15 percent up to 20 percent would be consistent with the literature, with the caveat that different studies give very different estimates and that it is highly likely that any 'true' figure is context dependent.

2.1.2 Emergency readmissions by diagnostic group

In their systematic review of 37 research studies to identify factors associated with preventable readmissions, Vest et al. (2010) argued that the aetiology of readmissions is likely to vary by index condition or procedure, and they therefore distinguished four groups of studies: those relating to any or non-condition specific readmissions, cardiovascular-related, other surgical procedures and all other conditions.[14] The authors identified a few studies which provided specific readmission rates for different conditions and procedures. For example:

- Studying 16,325 patients discharged following coronary artery bypass graft (CABG) surgery in New York state in 1999, Hannan et al. (2003) reported that 15.5 percent of patients were readmitted within 30 days; of these readmissions, 84.5 percent were related to CABG surgery (12.9 percent of patients).[41] Ferraris and colleagues (2001), reporting on 2,650 patients in one hospital undergoing cardiac surgery found the readmission rate to be 9.8 percent[42] while Sun et al. (2008), analysing data on 2,157 patients after CABG surgery and considered low risk, reported a readmission rate of 6.3 percent.[43]
- Readmission rates appear to be somewhat higher for those initially admitted for heart failure. For example, in an analysis of Medicare claims data for over 560,000 heart failure hospitalisations in 2004, Keenan et al. (2008) reported a readmission

rate of 23.6 percent.[44] Harjai et al. (2001), examining consecutive cases of heart failure patients, identified the readmission rate for any cause to be 26.2 percent.[45] More recent analyses not included in the review by Vest et al. (2010)[14] report similar figures. For example, Joynt et al. (2011), analysing files of more than 3.1 million Medicare beneficiaries in the USA discharged from hospital from 2006 to 2008, found readmission rates for patients with congestive heart failure to be around 27 percent (black: 27.9, white: 27.1).[46] However, a study by Jha et al. (2009), using similar data, found 2007 readmission rates for those with congestive heart failure to vary widely across hospital-referral regions across the USA, from 13.2 percent to 36.3 percent.[47]

- O'Brien et al. (2007), in a study of 787 consecutive elective laparoscopic colon and rectal operations performed over a five-year period for whom there was adequate follow-up data, found the rate of unplanned readmissions within 30 days to be 10 percent.[48] A similar rate of 10 percent for readmissions following abdominal surgery was reported by Kiran et al. (2004).[49]

Examining preventable readmissions, the analysis provided by Goldfield and colleagues (2008) described earlier reported rates (PPR chain) within 15 days following discharge for the top ten diagnosis-related groups (DRGs) for medical candidate admissions to be as follows: heart failure 12.5 percent; chronic obstructive pulmonary disease (COPD) 9.7 percent, schizophrenia 17.7 percent; other pneumonia 7.7 percent; major depressive disorder 10.9 percent; angina pectoris and coronary atherosclerosis 5.6 percent; bipolar disorders 14.0 percent; septicaemia and disseminated infection 12.6 percent; renal failure 12.8 percent; and cardiac arrhythmia and conduction disturbance 6.3 percent.[36] For all other medical conditions the respective PPR chain was 2.9 percent. For the top ten surgical intervention DRGs, rates ranged between 4 percent for knee joint replacement to 12.3 percent for coronary bypass procedures; with rates for all other surgical procedures given at 6.1 percent.

In summary, it appears that no single diagnostic group or set of conditions stands out as being responsible for a high proportion of readmissions.

2.2 Extent to which emergency readmissions that are considered avoidable can be attributed to deficiencies in the original hospital care

In an attempt to determine factors that can be associated with preventable readmissions, Vest et al. (2010) noted that there appears to be little systematic work on factors than can specifically be attributed to the original hospital care, with for example most studies on any or non-condition specific readmission focusing on patient-related factors (see below).[14] Where hospital-related factors were identified, these most commonly concerned increased length of hospital stay to be positively associated with subsequent readmission, although one study also pointed to short length of stay to be associated with early readmission (following cardiac surgery).[50] One other comparatively common factor was discharge to home healthcare, another health facility, skilled nursing facility, or rehabilitation facility, although this has been interpreted as largely reflecting the severity of the patient's condition.[14]

Studies reviewed by van Walraven et al. (2011a)[11] noted the following (see also Table 2.4):

- An analysis of all readmissions (excluding dialysis) within 28 days to a single Australian hospital network carried out by Miles and Lowe (1999) concluded that 5.5 percent of readmissions may be attributable to poor or inappropriate medical management.[31]
- Balla et al. (2008) examined 30-day readmissions to an academic medical centre in Israel, reporting that 33 percent of all readmissions (90/271) were associated with quality of care problems.[24] These were deemed preventable, mostly involving a vascular event or congestive heart failure. Quality of care problems were identified to be not mutually exclusive and included incomplete case 'work-up' (33 percent), short length of hospital stay (31 percent) and inappropriate medication (44 percent), with diagnostic errors (16 percent) and disregard of laboratory findings (12 percent) also playing a role.
- Witherington et al. (2008) analysed unplanned readmissions within 28 days for patients aged 75 years and older, finding that for 38 percent of readmitted patients (n=41), readmission was related to medication.[35] Of these, 61 percent were considered preventable. Other quality of care issues related to communication in relation to discharge, eg no discharge letter being the case for 54 percent of the unplanned readmissions.

However, there are some inconsistencies between studies reviewed by van Walraven et al. (2011a).[11] For example, the analyses by Balla et al. (2008)[24] and Williams and Fitton (1988)[34] found readmission to be associated with shorter length of stay and unresolved medical problems. In contrast, Halfon et al. (2002) noted that readmission was associated with multiple comorbidity and longer length of stay of the original admission.[21] Similarly, in the study by Kirk et al. (2006), patients and carers believed the readmission could have been avoided if they had stayed longer in hospital during the first admission.[28]

Studies reviewed by Vest et al. (2010)[14] included the analysis of patients discharged following CABG surgery in New York by Hannan et al. (2003), which found that 84.5 percent of readmissions (15.3 percent of patients undergoing surgery) were attributable to complications directly related to the CABG as noted earlier.[41] The most common causes of readmissions were postsurgical infection (28.3 percent of readmissions), heart failure (15.7 percent), myocardial ischemi or infarction (7.9 percent) and arrhythmias (7.7 percent). However, the percentage of related readmissions that could be considered to be preventable remained uncertain. The authors noted increased risk of readmission for CABG complication where the performing surgeon had low CABG operating volumes of under 100 per annum.

As for surgical procedures more generally, while the evidence remains patchy overall, healthcare-related factors appear to be more clear-cut, with increased likelihood of early readmission following certain procedures and/or associated with infections. Studies of laparoscopic surgery point to conflicting evidence, with some suggesting early readmissions to be more common among patients after conversion from laparoscopic to open operation[48] while others reported the laparoscopic approach to be associated with higher levels of early readmissions.[51] Evidence on laparoscopic surgery is difficult to interpret,

however, although these studies point to a common factor related to patients who were sicker or underwent more complex procedures and were therefore more likely to be readmitted.

Other conclusions drawn by studies reviewed by Vest et al (2010) regarding the association between the quality of hospital care received and readmission include the following:

- Reddy et al. (2009) studied readmission after pancreatectomy for pancreatic cancer in 1,730 Medicare patients aged 66 years and older for the period 1992–2003.[52] While not explicitly analysing preventability, the authors found 80 percent of readmissions within 30 days (16 percent of all readmissions) to be related to operative complications at 30 days, including complications (27.4 percent) and dehydration (27.8 percent).
- Aujesky et al. (2009) analysed data of 14,426 patients discharged from 186 Pennsylvania hospitals following index admission for pulmonary embolism between January 2000 and November 2002.[53] Of those readmitted within 30 days following discharge, 26.9 percent were readmitted for recurrent venous thromboembolism or bleeding. The authors argued that as both conditions can be related to anticoagulation quality, a considerable proportion of these should potentially be avoidable. Readmissions varied significantly by hospital region but there were no clear associations with other hospital factors. A positive association with the number of beds in the univariate model disappeared following adjustment, although teaching hospitals were shown to have a significantly elevated risk of readmission for bleeding. The study did not assess whether variation in readmission rates by hospital location was attributable to variation in the quality of inpatient and outpatient care.
- The study by Ferraris et al. (2001) mentioned earlier analysed risk factors for readmission following cardiac surgery.[42] Of more than 70 variables that may potentially predict risk for readmission, only six were identified to be significant; these were largely patient related (eg female sex, pre-existing disease such as diabetes, and chronic lung problems). Factors that were related to the original care received, such as type of procedure, other intraoperative and postoperative variables, hospital length of stay and others were not found to be significant in the multivariate model.
- Goldfield et al. (2008) noted that the majority of potentially preventable readmissions (PPR) were clinically related to the initial admission.[36] Around half of all readmissions were due to continuation or recurrence of the initial condition; between 12 percent and 20 percent were attributable to closely related conditions; around 20–30 percent were for an acute medical complication plausibly related to the initial admission; around 1–2 percent were attributable to surgical procedures to address a continuation or recurrence of the initial condition; and 0.5–2 percent were for surgical procedures to address complications resulting from care received in the initial admission. Around 10–20 percent were unrelated to the initial admission. This does not necessarily mean care was deficient in all these cases, however.

García-Pérez and colleagues (2011) reviewed 12 prospective cohort studies that explored the relationship between the risk of readmission with clinical, socio-demographic or other factors in patients aged 75 years and over.[9] They included five studies that assessed risk factors for readmission within one month following discharge (and considered 'avoidable'). Among these, the most frequent factors considered to be healthcare related were hospital admission prior to the index admission during the past three or six months, and longer hospital stay during index admission. One study also identified pressure sores as a risk factor, which may or may not be related to the quality of care provided in hospital.[9] Emergency admission prior to index admission and higher number of prescribed drugs were also found to be associated with higher risk of readmission.

Lichtman et al. (2010) conducted a systematic review to identify and evaluate statistical models that compare hospital-level post-stroke readmission rates, evaluate patient-level risk scores predicting readmission, or describe patient and process-of-care predictors of readmission after stroke.[12] Among studies examining hospital readmissions within 30 days, physician speciality was found to be statistically significant in two analyses. Thus, Roe (1996), who analysed all-cause readmissions by reviewing medical records of 164 patients from 1990 to 1992 in one Australian teaching hospital, found a significant difference in admission rates among units treating stroke, although the direction of the association was uncertain.[54] Smith et al. (2006) examined 30-day readmissions following discharge with acute ischemic stroke, using Medicare and Medicaid data of 44,099 US patients from 1998 to 2000.[55] They were able to demonstrate that patients who were seen by a neurologist had 'a borderline lower risk' of readmission compared with those seen by a generalist. However, the association varied by condition, with risk of readmission for infection and aspiration pneumonitis significantly lower for those seen by a neurologist, by 12 percent, whereas readmission risk for heart and non-acute cerebrovascular disease was significantly higher (17–19 percent). In contrast, Lindenauer et al. (2007) failed to establish a significant association between physician speciality and all-cause readmission rates (within 14 days), comparing hospital internists ('hospitalists') with general internists or family physicians in a retrospective cohort study of 76,926 patients in 45 hospitals in the USA from 2002 to 2005.[56]

Further analyses reviewed by Lichtman and colleagues (2010)[12] can be summarised as follows:

- Hospital characteristics conceptualised as certification by the US Joint Commission were found to be associated with all-cause readmissions by Lichtman (2009) in an analysis of Medicare data of 366,551 patients in 5,070 US hospitals in 2002.[57] The study showed that 30-day readmission rates were 13.8 percent in hospitals which were scheduled for certification, compared with 14.6 percent in those which were not; while this difference was found to be statistically significant, its clinical relevance is uncertain.
- Discharge planning was statistically significant in all-cause readmission in a study by Chuang et al. (2005), which analysed data from patient interviews through 1999 and 2000 in Taiwan's capital Taipei covering 489 patients in seven hospitals.

Ross et al. (2008) conducted a systematic review to describe statistical models designed to compare hospital rates of readmission for patients admitted with heart failure and to identify studies evaluating patient characteristics associated with hospital readmission.[17] They found that none of the 117 studies included in the review included a model designed to compare readmissions rates between hospitals. However, one of the studies provided some evidence on the statistical significance of some hospital factors. Thus Kossovsky et al. (2000), using a case-control design of 91 cases of unplanned readmissions among heart failure patients within 31 days and 351 controls, found that these were not significantly associated with quality scores attributed to the admission work-up or evaluation and treatment during hospital stay.[58] However, they did find some association with readiness for discharge: for each 10 percent decrease in the proportion of criteria met, the odds of readmission for all causes increased by 14 percent (odds ratio [OR]: 1.14, p=0.04) and by 19 percent heart-failure-related readmissions (OR: 1.19, p=0.01). Associations were stronger for patient medical history such as previous diagnosis of heart failure (OR: 2.9, p <0.001), age (OR: 3.3, p=0.01 for patients aged 65–79 years and OR: 4.1, p=0.004 for patients aged 80 years and older) and history of cardiac revascularization (OR = 2.1, 95 percent CI: 1.2 to 3.9, P = 0.01). These statistics are for all-cause readmissions, but findings were similar for heart-failure-related readmissions.

Most recent evidence from two primary studies of avoidable readmissions has sought to isolate 'system factors' from 'clinician factors'. Thus Yam et al. (2010b), in an analysis of unplanned readmissions in Hong Kong, conceptualised system factors as related to inadequate discharge planning, lack of care coordination, inadequate end-of-life care and other factors; these explained about 15 percent of preventable readmissions.[38] Clinician factors such as premature discharge, drug-related adverse events, and diagnostic and measurement errors explained about 42 percent of preventable readmissions (see also Table 2.5). Van Walraven et al. (2011b), reviewing urgent readmissions among patients discharged from hospitals in Ontario, Canada, defined system 'errors' as those relating to flaws in design of the healthcare system that lead to inefficiency in care or to patient harm, including, for example, communication errors.[40] Such errors were identified to contribute about 15 percent to avoidable readmissions, whereas the majority of readmissions (48 percent) were associated with provider management errors.

Overall, however, there remains a wide variation of studies with regard to definitions, terminology and methodological challenges, and, as noted by Vest et al. (2010), 'clear gaps' in the evidence on the actual effects of organisation-level factors on early or preventable readmissions; what is available leaves uncertainty as to the 'magnitude or validity of the effect because statistical assumptions were violated' (p. 22).[14] Findings are therefore difficult to translate into guidance for the operation and management of healthcare organisations. They suggested that the impact of the care at hospital of admission is not robustly demonstrated or explained, emphasising that organisational factors received little attention from studies included in their review (three of a total of 37 studies). This last point was also highlighted elsewhere, noting the restriction of some studies of avoidable readmissions to the identification of clinical factors, with the role of organisational factors, such as failures in coordination and communication, which may be important factors in the prevention of readmissions frequently overlooked.[59-60]

Additional insights into the extent to which emergency readmissions that are considered avoidable can be attributed to deficiencies in the original hospital care are provided by intervention studies aimed at reducing the risk of hospital readmission. These included, for example, a systematic review of 32 intervention studies (randomised controlled trials, RCTs) aimed at reducing the risk of hospital readmissions in patients aged 75 and over by Linertová et al. (2010).[13] Differentiating between in-hospital interventions (n=17) and interventions with home follow-up (n=15), the review found the majority of studies not to have an effect on the rate of readmission. Of those studies that assessed readmissions within one month following discharge (n=6), four found a (significant) reduction, although the size of the reduction varied considerably, and two a non-significant increase in readmissions. These can be summarised as follows:

- Interventions that led to a (significant) reduction in readmissions within one month of discharge included:
    - in-hospital daily visits by care coordinators and pharmacists, combined with post-discharge phone calls (proportion readmitted: 10 percent vs 38 percent in usual care; $p<0.05$) (USA)[61]
    - comprehensive geriatric assessment and multidisciplinary intervention (DEED II Study) (proportion readmitted: 61 percent vs 82 percent in usual care; $p<0.05$) (Australia)[62]
    - care transitions intervention with in-hospital visits, home visits and telephone follow-up by a transition coach (proportion readmitted: 8.3 percent vs 11.9 percent in usual care; $p<0.05$) (USA)[63]
    - in-hospital structured, multi-component, early rehabilitation programme (proportion readmitted: 17.7 percent vs 19.4 percent in usual care; not significant, n.s.) (Australia).[64]
- Interventions that resulted in a non-significant increase in readmissions within one month of discharge included:
    - geriatric follow-up through home visits by district nurse one day after discharge and by patient's GP two weeks after discharge (proportion readmitted within ten days following discharge: 12.6 percent (n=18) vs 6.3 percent (n=9) in usual care; n.s., and proportion readmitted within days 11–30 following discharge: 8.4 percent (n=8.4) vs 6.3 percent (n=9) in usual care; n.s.) (Denmark)[65]
    - health visitor follow-up within 24 hours post discharge (proportion readmitted: 11.6 percent (n=27) vs 9.3 percent (n=18) in usual care; n.s.) (UK).[66]

It is important to highlight that the number of study participants in the latter two studies was low. Also both were carried out in the early to mid-1990s.

Purdy (2010), in a recent overview of research evidence on avoidable admissions, highlighted a number of findings that have sought to link interventions in hospital with a reduction in hospital readmissions.[8] Based on systematic reviews of related studies, the overview identified good evidence that structured discharge planning is effective in

reducing future readmissions.[67-68] It should however be noted that these typically consider readmission periods of more than 28 days. Conversely, the evidence remains mixed for other hospital-based or hospital-initiated interventions such as telephone follow-up post-discharge.[8] The latter is illustrated by two recent primary studies examining the impact on (telephone) follow-up after discharge, with one retrospective review of discharge summaries of general medicine patients from Mayo Clinic hospitals in Minnesota, USA, finding no difference in 30-day readmissions between those with and those without a follow-up appointment.[69] One other study found receipt of a discharge telephone call among patients to hospital for any cause to be associated with reduced readmission, with those in the intervention group 23 percent less likely to be readmitted within 30 days than those receiving usual care.[70] Study population (although both Medicare patients) and design as well as intervention are not entirely comparable, however. The evidence of comprehensive geriatric assessment for older adults admitted to hospital remains equally inconclusive, with a recent meta-analysis of relevant randomised controlled trials failing to identify supporting evidence for such interventions to reduce future readmissions.[71-72] However, readmission periods considered were typically 3–12 months after discharge.

2.3 Extent to which emergency readmissions that are considered avoidable can be attributed to deficiencies in primary or community care, social care or both

There is some overlap with the preceding section's findings on factors that may be attributed to health and/or social care outside hospital. The next section describes some of the factors that have been identified: social and caregiver support and discharge destination.

2.3.1 Social and caregiver support

Vest et al. (2010) reported on one study which found unplanned readmissions to be higher among patients whose carers had 'inadequate support'; lack of 'social support' was frequently defined as a factor to be associated with a higher risk of readmission.[14] Schwarz (2000), in a prospective study of older persons with functional impairments, using chart review and interviews with family caregivers shortly after hospital discharge and three months later, found social support was negatively related to the number of hospital readmissions.[73]

Likewise, García-Pérez et al. (2011) reported lack of wider family support to act as a risk factor for readmissions, as did living in a home for the elderly.[9] Among the studies reviewed, Lotus et al. (2004) explored family caregivers' need as a risk factor for readmission within one month following discharge to a medical centre in Taiwan, prospectively studying 216 older patients and their families.[74] Controlling for other variables, readmission was 5.3 times more likely for those whose caregiver requested support (CI 1.47–19.34) than for those where this was not the case. Conversely, where caregivers did not request social services support, older patients who were not totally dependent on the caregiver were less likely to be readmitted (OR=0.08, CI 0.014–0.41). The authors concluded that caregiver burden might be considered as a preventable cause for unplanned readmissions, though noted that this factor may simply represent proxies for

severity of illness, and it remains unclear to what extent disease severity was accounted for in their analysis.

In their review of predictors of readmissions after stroke, Lichtman et al. (2010) examined the significance of a range of different factors pertaining to readmissions within one month, including post-hospital care. Conversely to the findings reported by Lotus et al. (2004), Chuang and colleagues (2005) did not identify caregiver burden to be associated with readmissions.[75]

Finally, the primary study by Yam et al. (2010b) described earlier (Table 2.5) identified the carer system, alongside lack of support and community system, to be associated with avoidable readmissions, but the overall contribution of this factor was considered small.[38]

2.3.2 Discharge destination

Lichtman et al. (2010) reported discharge destination or level of continued care to be statistically significant, citing Chuang et al. (2005)[75] and Smith et al. (2005).[76] However, in an analysis of Veterans Affairs (VA) hospital administrative data and Medicare data for patients aged 65 or older with chronic obstructive pulmonary disease (COPD), stroke or dementia, Camberg et al. (1997) did not find evidence for an association between discharge destination and readmissions.[77] A lack of association was reported by Smith et al. (2006) in their analysis of stroke-related readmissions.[55] At the same time, Camberg et al. (1997) noted that patients with COPD and dementia who were discharged into the community and veterans health administration nursing homes, respectively, were less likely to be readmitted within 30 days than those discharged to their own homes.[77] For example, in the case of COPD, the relative risk of readmission from a nursing home compared with own home was 0.734 (CI 0.579–0.929), and for dementia it was 0.666 (CI 0.475–0.935).

Conversely, studies reviewed by Vest et al. (2010)[14] identified discharge to skilled nursing and/or rehabilitation facility to be associated with higher rates of readmissions among patients discharged within 30 days following CABG surgery.[41] One other study found discharge to a discharge home with supplemental care to be a risk factor for readmission following pulmonary embolism, with the latter identified to be independently associated and therefore not entirely explainable by disease severity.[53]

2.3.3 Nurse-led management during and post-discharge

Purdy (2010) reported on a select set of systematic reviews of studies examining the impact of nurse-led case management during and post-discharge.[8] The overall evidence remains conflicting, with one review identifying nine studies in which the relative risk for readmission and length of stay in the intervention group ranged from substantially lower to significantly elevated.[78] However, one systematic review of nurse-led units in the UK found these to reduce early hospital readmission when compared with usual care for patients aged 18 and over while being associated with higher costs.[79]

2.4 Proportion and type of emergency admissions that are potentially avoidable and can be attributed to factors other than health and social care

The most common factors described to be associated with hospital readmissions were identified as 'patient-related' in most reviews. These are factors that cannot be attributed to the quality of care received. Factors include sociodemographic or lifestyle characteristics such as age, race or ethnicity, socio-economic status, health status (multi morbidity or comorbidity, physical impairment) including self-rated health, living alone and others.[14-15]

However, the extent to which any of these factors, on their own or in combination, plays a significant role in contributing to or determining readmissions varies among studies. For example, in their review of 12 prospective cohort studies that explored the relationship between the risk of readmission with clinical, socio-demographic or other factors in patients aged 75 years and over, García-Pérez and colleagues (2011)[9] cite evidence from Comette et al. (2005), who analysed data on 596 patients aged 70 years and older in Belgium. They found risk for readmission within one month to be associated with previous hospitalisation within three months, longer length of stay, and a discharge diagnosis for respiratory or genito-urinary conditions.[80] Similar factors relating to severity of illness were identified to be significant by Kwok et al. (1999) in a study of 1,204 patients aged 70 years and older in Hong Kong.[81] Here, readmission within one month following discharge was predicted by length of stay, Barthel index (assessment of physical and mental function) and unresolved medical problems. Factors such as level of support or living in a home for the elderly were only significant over longer time scales.

Regarding socio-demographic and socio-economic factors, studies reviewed by Vest et al. (2010)[14] provide a range of insights:

- Hannan and colleagues (2003), in their analysis of patients undergoing heart surgery in New York state, identified older age, female sex and race to be associated with higher rates of readmission within 30 days following CABG.[41]
- Aujesky et al. (2009), in their analysis of patients discharged from hospital following admission for pulmonary embolism, found race (OR 1.19, CI 1.02–1.38) and insurance status (Medicaid insurance) (OR 1.54, CI 1.31–1.81) to be independently associated with readmission within 30 days following discharge, with severity of illness also playing a significant (and independent) role.[53]
- Jiang et al. (2005) analysed data on adult patients admitted for diabetes-related conditions in five US states.[82] They found, among Medicare patients, the risk of readmission at 30 days following discharge, to be significantly higher among Hispanics than among white Americans (OR=1.21). It was also notable that readmission rates were significantly higher among Medicaid and Medicare patients than those with private insurance, likely reflecting socio-economic class, age (for Medicare patients) and/or level of access to primary care. Similar observations were reported by Hasan et al. (2010) in a study of 10,946 patients discharged home from general medicine services at six academic medical centres in the USA, which identified insurance status as one (of seven) significant predictors for readmission within 30 days.[83]

It is noteworthy that Laniece et al. (2008),[84] reviewed by García-Pérez and colleagues (2011)[9], in an analysis of 1,306 patients aged 75 years and older from nine French hospitals, did not find sociodemographic factors (age, sex) and living environment (eg level of isolation, low income) to be significantly associated with readmission within 30 days following discharge.[84] The study by Laniece et al. (2008) was identified by García-Pérez et al. (2011) to be the highest quality paper that studied the risk of readmission at one month.[9]

The review by Lichtman et al. (2010) also reported a range of sociodemographic variables to be considered by one or more studies, such as age, sex, race or ethnicity, marital status, socioeconomic status, insurance type and geographic region.[12] However, in most instances, the statistical importance of these factors regarding readmission risk was not reported or remained unclear. For example, Chuang et al. (2005) reported age, sex, race or ethnicity and socioeconomic status not to be statistically associated with readmissions[75] while Smith et al. (2005) identified insurance type to be statistically significant in both all-cause and stroke-related readmissions.[76] Camberg et al. (1997) found proximity to the hospital to be significant in all-cause readmissions.[77]

Ross et al. (2008) noted that although a range of sociodemographic factors such as age and sex are considered in different studies examining heart failure readmissions, it was not possible to draw consistent conclusions from studies reviewed.[17] Five of the studies included developed models to predict patient risk but none of these found patient characteristics to be strong predictors for readmissions.

We discuss these issues further in Section 3.5.1on case mix adjustment.

CHAPTER 3 Experience in four countries

This chapter aims to provide a synopsis of work in a small sample of countries designed to better understand current patterns of readmissions and the interpretation of observed patterns and trends within the context of the relevant healthcare system. We consider four countries: England, the USA, Australia and the Netherlands. The chapter draws on a combination of sources, including documented evidence (England) and consultation with experts in the field (the USA, Australia and the Netherlands).

3.1 England

Rates of emergency readmission to hospital within 28 days following discharge have been published by the National Centre for Health Outcomes Development (NCHOD) since 1998/99.[85] Rates are available for all causes and selected conditions (stroke, fractured proximal femur) and procedures (primary hip replacement surgery, hysterectomy), as well as by sex (male, female, both) and age group (0–15, 16–74, 75+ and 16+), for the period 1999/2000 to 2008/09.[86-87] Rates are disaggregated to the level of different geographical and administrative tiers, with England forming the highest level of aggregation and providers (trusts) the lowest; data are also disaggregated by deprivation group (five or seven levels of Index of Multiple Deprivation considered).

The basis for readmission is the number of finished and unfinished continuous inpatient spells that are emergency admissions within 0–27 days (inclusive) of the last, previous discharge from hospital, including those where the patient dies, over the total number of finished continuous inpatient spells during the given period. Readmissions rates as published by NCHOD exclude those for mental health and maternity specialties and those with a diagnosis of cancer, on the basis that in these cases emergency readmission is frequently considered a necessary part of care. Indeed, in relation to mental health, it has been argued that a high number of readmissions in a given period, alongside long (cumulative) lengths of stay, might reflect inadequate care in the community while, conversely, too few readmissions, along with short cumulative lengths of stay, may be more closely related to suboptimal hospital care. Lakhani et al. (2005) proposed combining these two measures for a given period to better understand variation among provider organisations and so derive potential target ranges for acceptable patterns of care.[88]

Readmission rates as presented by NCHOD are indirectly standardised by age, sex, method of admission and diagnosis or procedure; figures are published as raw numbers, indirectly standardised rates with confidence intervals, comparison banding and

improvement banding. Data do not allow for adjustment for factors such as differences in severity of illness, comorbidities and other potential risk factors that contribute to an observed variation between units and/or over time. However, there are possibilities for comparison with data being presented in clusters that are similar in institution or organisation type. Also, as noted earlier, data are available by deprivation level.[87]

A preliminary analysis of trends in emergency readmissions found a consistent rise in (standardised) rates for patients aged over 16 years, from about 7.8 percent in 1998/99 to 9.8 percent in 2005/06.[85] Further decomposition of data found associations between a number of factors such as age, sex, index admission, geography and socio-economic status, these factors failed to fully explain the observed rise; however, changes in case mix, in particular age and sex of patients, method of admission, diagnosis, or procedure explained 20 percent of the annual growth. The analysis further pointed to some evidence for a (weak) inverse association between length of stay and readmissions.

More recently, a renewed attempt was undertaken to examine observed trends in emergency readmissions in more detail, with a particular focus on more recent years (to 2006/07) and age group (16–74 years and 75 years and over), in order to better understand whether and to what extent the rise in emergency readmissions reflects changes in the quality of care provided.

The key findings of the recent analysis of emergency readmissions are as follows:[85]

- For those aged 16–74 years, the readmission rate rose from 7 percent in 1998/99 to 9 percent in 2006/07 (age 75+: 10 percent and 14 percent).
- The rate of increase accelerated from 2002/03, with stabilisation indicated for 2006/07 (Figure 3.1). The sharp increase in rates coincided with an increase in the number of emergency readmissions coded to the speciality of A&E.
- About 25 percent of an observed increase in readmission rates for those aged 16–74 years since 2003/04 is explained by changes in case-mix (75+: 8 percent).
- Conversely to the earlier analysis, there was little evidence for an association between decreasing length of stay and higher rates of readmissions.

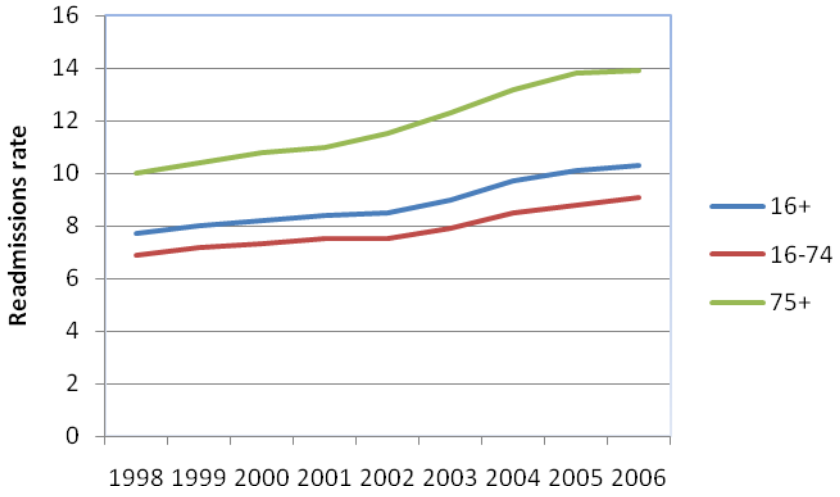

Figure 3.1 Trends in emergency admission rates by age group in England, 1998–2006

SOURCE: Department of Health (2008)[85]

3.2 The USA

The USA does not generally distinguish between planned and unplanned admissions, so their readmission rates include both. There is some flexibility in England around how admissions are defined, eg specialists may admit an elective patient through Accident & Emergency (A&E) as an 'emergency' as an easy way to get a bed. The Department of Health needs to be aware of ways in which performance management of emergency readmissions may lead to a change in coding practice.

In interpreting US data, it is important to understand that until recently readmission rates were only calculated where they related to the original hospital, and this underestimates rates of readmission by as much as 50 percent.[36] More recently, analyses in the USA refer to readmission to any hospital.

The National Committee on Quality Assessment (NCQA) is currently introducing a measure of 30-day readmission rate, proposed for inclusion in the 2011 Healthcare Effectiveness Data and Information Set (HEDIS) to be reported for all health plans.[19] In common with all NCQA measures, it will not be publicly reported in the first year, and any comparative data provided to hospitals or health plans will be at a very general level. It will probably be introduced as an accreditation standard in about two years.

The Centers for Medicare and Medicaid Services (Medicare) have developed indicators for readmission, initially for three specific conditions (pneumonia, heart failure and acute myocardial infarction), which were publicly reported on its website Hospital Compare from June 2009.[89-90] The Patient Protection and Affordable Care Act (2010) requires Medicare to reduce payments to hospitals with high readmission rates and these hospitals will be subject to financial penalties from 2013, based on three-year rolling averages.

Smaller health plans typically do not have sufficient numbers for reliable reporting of these cases, but clustering similar diagnoses helps this. The general correlation between rates of

readmission for different conditions is low (typically 0.3–0.4 percent) suggesting that generalisable factors that will reduce admissions are limited. Combining several years of data (as with CMS above) helps with the problem of small numbers.

US hospitals with high admission rates tend to have low readmission rates (they may admit less sick people). Our key informants noted the opportunity for hospitals in England to game the readmission indicator by increasing short admissions and thereby the denominator for readmission rates (and to gain financially). The Department of Health should also note that if short term low morbidity admissions decrease (possible as a result of the relaxation of the four-hour A&E target), then England may see a rise in the rate of readmissions, although not in absolute numbers.

Admissions for maternity and rehabilitation admissions are most often excluded from US figures on readmissions. Mental health admissions tend to be included. Our key informants did not see the need to exclude cancer, as cancer admissions are adequately allowed for in their risk adjustment models. Our informants all regarded risk adjustment as essential (see Section 3.5.1).

3.3 Australia

Readmission rates are generally accepted as a monitoring indicator in Australia rather than a definitive performance indicator, not as a definitive sign that something is wrong. Currently, only New South Wales and Western Australia can measure true readmission rates, with linkage of data from different hospitals. However, all states are beginning to feed back data to hospitals, although in a very low key way without any significant performance management attached. Since funding and organisation of hospital and community care is separate, data are currently only being shared with hospitals. Data are not publicly reported, except as an aggregate indicator at national level, reporting on 28-day readmission rates following selected surgical procedures including hip and knee replacement, cataract extraction, hysterectomy and others.[91]

Condition-specific readmission rates suffer from the 'small numbers' problem but Australia is nonetheless planning to feed back unplanned hospital readmissions of patients discharged following management of acute myocardial infarction, heart failure, knee and hip replacements, depression, schizophrenia, paediatric tonsillectomy and adenoidectomy. The mental health indicators have been accepted nationally by mental healthcare providers for some time.[92]

In some states, the data are fed back in a way which allows the providers to drill down and get to actual patient details. This is regarded as very valuable as hospitals require detailed clinical audit data if they are to evaluate the nature and scope of avoidable factors.

3.4 The Netherlands

Hospital readmissions are not currently used in the Netherlands as a means to assess the quality of care provided by hospital. In contrast, avoidable admissions are used as an indicator for the quality of primary care; the indicator is routinely used within the Dutch

healthcare performance framework[93] although at present for the purpose of international comparison only. It is envisaged that the use of this indicator for regional benchmarking will be expanded in future.

The indicator of hospital readmissions is being discussed for potential use. However, a major barrier against the more widespread use is the lack of personalised hospital data that would allow for calculation of this indicator. Hospital statistics are based on cases or episodes rather than persons, using the Dutch system of diagnosis-related groups (DRGs) ('Diagnosis Treatment Combinations' (DBCs)). DBCs are defined as the 'whole set of activities and interventions of the hospital and medical specialists resulting from the first consultation with and diagnosis by the medical specialist in the hospital'.[94] Unlike DRGs, DBC coding begins with the start of the treatment and ends with treatment completion. The maximum duration of a DBC is one year. Treatment episodes lasting over a year are assigned a new DBC and classified as a 'chronic periodical check up'.[95] Consequently, emergency readmissions are covered in the lump sum that a hospital receives for a DBC. While it would technically be possible to link data to individual patients, the administrative burden (and associated costs) is high and there is currently not sufficient support to encourage routine generation of hospital readmission rates.

3.5 Considerations for the use of hospital readmissions in practice

3.5.1 Risk adjustment

As with other countries, data from National Centre for Health Outcomes Development (NCHOD)[85] and other UK studies[96] confirm there is a strong association between rates of readmission in England and socio-demographic factors. Our US informants all regarded risk adjustment of rates of readmission as essential.

The NCQA approach is to risk adjust for the primary admission diagnosis and all comorbidities recorded in the previous year. They specifically do not measure comorbidities in the index admission to reduce the risk of gaming (ie upcoding to maximise an individual patient's risk category). Additional risk adjusters include age, gender and whether the case is medical or surgical. For risk adjustment, CMS uses published hierarchical regression models.[97-100]

CMS does not risk adjust for race, although it is a strong predictor of readmission. This is because they do not wish to mask socio-demographic inequalities in the delivery of care. However, our informants advise that if rates are not adjusted for socio-demographic factors, any payment link needs to be introduced very cautiously or hospitals serving areas with low income population may suffer.

There are arguments for and against risk adjusting data. There may be a case for not adjusting for socio-demographic characteristics apart from age. However, we believe that it is important to risk adjust readmission rates for diagnosis and comorbidity if hospitals are to be validly compared.

3.5.2 Unit of analysis

An important issue is whether readmission rates can be reported for individual hospitals and individual conditions.

Data provided by NCHOD suggest that populations of around 150,000 are sufficient to report annual rates of admission for individual hospitals. Some larger trusts may have sufficient cases to report reliable readmission rates for one year, eg stroke and fractured neck of femur. However, for most individual diagnoses or groups of diagnoses, much larger populations are needed in order for a hospital to be reliably characterised by its rate of admission. An alternative is to publish three-year rolling averages, such as undertaken by CMS in the USA, which smoothes out random variation associated with small numbers of admissions.

3.5.3 Acceptable rates of readmission

A further question is that of an acceptable rate of readmission. We were unable to identify data to answer this question directly, or data that examined directly the relationship between rates of readmission and the proportion judged avoidable.

Our US informants strongly advised against publishing an 'ideal' or 'target' rate for readmissions. Despite extensive experience of using readmissions as a metric in the USA, they have consciously avoided this. Rather they advise benchmarking against local best practice (eg the top quartile in a region) or assessing solely against improvement rather than against arbitrary standards.

CHAPTER 4 Discussion

Our review of the literature shows wide variation in definitions of readmission, assessments of the avoidability of readmissions, and identification of factors that may prevent readmission. The proposed 28-day readmission rate is likely to reflect a balance between hospital and community factors that might influence readmission.

Using a 28-day readmission rate, it seems likely that around 15 percent to up to 20 percent of readmissions could be regarded as avoidable. The most promising interventions to prevent readmission appear to be those that concentrate on coordination and communication around the time of discharge.

As with any high stakes assessment, the introduction of readmission rate as a performance indicator for the NHS and its link to payment (reduced payment for readmission) carries the risk of unintended consequences. Averill et al. (2011) recommend the following guidelines should be followed when payment is linked to hospital rates of readmission:[101]

1. *Payments should initially focus on those outcomes for which a quality failure results in an increase in payment.* Readmission rates in the UK meet this criterion to the extent that around 15 percent of readmissions may be considered avoidable. However, it is important to understand that the great majority of readmissions do not meet criteria for avoidability.
2. *Financial incentives should be substantial enough to induce hospital behaviour change.* This certainly appears to be the case with the current NHS Operating Framework. However, caution should be exercised in relation to the size of the reduction in the hospital tariff payment for readmissions: the greater the incentive (or disincentive), the greater the likelihood of perverse or unexpected consequences.
3. *Financial incentives should focus on outcomes that are amenable to quality improvement efforts*.
4. *Outcome standards should be empirically derived based on performance levels that are being achieved by the best-performing hospitals*.
5. *Payers should not mandate the specific care processes that hospitals use to achieve the paying-for-outcome standards*.
6. *Financial rewards and penalties should be determined based on a hospital's overall relative outcome performance and applied as an overall hospital payment adjustment, rather than as a patient-specific payment adjustment*.

7. *The determination of the relative performance of a hospital must be risk adjusted to take into account severity of illness.* We note that the NHS is not currently proposing to risk adjust data on readmission rates.

Within the scope of this review it was not possible to analyse the studies reported in our review in more detail as a means to explain differences between the percentages assessed as avoidable in different studies. However, we believe that this is unlikely to be fruitful because of the wide range of subjects and healthcare systems in which the studies took place. Prospective studies are needed to assess the proportion of readmissions that are avoidable in the contemporary NHS. In particular, the majority of published studies focus on clinical factors associated with readmission. Studies are needed of NHS organisational factors which are associated with readmission or might be altered to prevent admission.

We did not identify a single diagnostic group or set of conditions as being responsible for a high proportion of readmissions. In general, readmissions appear more common among sicker patients, eg those who have needed more complex procedures, who are discharged to nursing homes, and/or those who are socio-economically disadvantaged.

There is a belief, although only moderately well substantiated in the literature, that readmissions following surgery are more likely to result from deficiencies in hospital care, whereas readmissions following medical problems are more likely to result from deficiencies in community care or inadequate discharge planning.

There is a question as to whether some types of condition should be excluded from assessment of rates of readmission. Areas for exclusion commonly discussed in the literature include mental health, cancer chemotherapy, obstetric care and end of life care. Opinion is divided on whether readmissions for mental health should be included. For example, in Australia there is general professional acceptance of mental health readmission rates as being a valid indicator. Similarly, in its most recent report on health indicators in high income countries the OECD uses unplanned readmissions for selected mental health problems (schizophrenia and bipolar disorder) as a means to monitor the quality of mental healthcare.[102] Elsewhere, people have taken the opposite view. However, for chemotherapy, obstetric care and end of life care attempting to performance manage readmissions down could damage patient care. We are concerned that current NHS proposals propose to include all these diagnostic groups.

The introduction of new performance indicators always has the potential to produce gaming. Observers from the USA cite experience which suggests hospitals might increase income by admitting less serious cases, thus simultaneously increasing their income and reducing their rate of readmission. There is also the possibility that there may be some shift in coding of admissions between 'emergency' and 'elective' depending on the incentives. If hospitals are performance managed on the basis of readmission rates, it would be reasonable to expect that some behaviour of this type would occur.

Some interventions designed to reduce readmission have been robustly assessed in randomised controlled trials. Promising interventions include structured discharge planning. Evidence of the effectiveness of post-discharge follow up (including by telephone) remains mixed. Attention to any individual hospital process measure is likely to have a limited impact on readmission because there are so many aspects of care which, if

provided to an inadequate standard, could result in readmission. Nevertheless, within particular clinical departments, there are likely to be some obvious candidates for action – for example prevention of infection and deep vein thrombosis in orthopaedic surgery.

A number of risk prediction models have been developed in order to identify patients at risk of readmission who might benefit from particular interventions to prevent readmission. However, a recent systematic review of 26 such models designed for comparison of hospitals for clinical purposes, typically using 30-day readmission as the outcome, found them to perform poorly, highlighting the need for developing more appropriate approaches.[103]

There are strong associations between rates of readmission in England and clinical factors including diagnosis, and socio-demographic factors including age and ethnicity. There are arguments for and against risk adjusting readmission rates prior to publication. There may be a case for not adjusting for socio-demographic characteristics (apart from age) in order not to mask inequalities in the delivery of care. At the same time, it will be important to risk adjust readmission rates for diagnosis and comorbidity if hospitals are to be fairly and validly compared. Data from the USA suggest that hospitals may vary substantially in the type of patient case-mix that they admit. We do not know if this is the case in the UK, but strong advice from our US informants is that readmission data should be adjusted for illness severity and comorbidity.

There are insufficient admissions and readmissions for most conditions to allow reliable estimation of avoidable readmission rates over one year. Diagnoses either need to be aggregated into larger groups (eg medical or surgical) or by providing rolling three-year averages (as done by NCQA in the USA).

We advise considerable caution in using a target rate for readmissions which would act as an acceptable benchmark (eg 15 percent of readmissions). Although attractive to UK governments, our US informants strongly advise against using this type of 'ideal' or 'target' rate for readmissions. Despite extensive experience of using readmissions as a metric in the USA, they have consciously avoided this. Instead they advise benchmarking against local best practice (eg the top quartile in a region) or assessing against improvement rather than against arbitrary standards.

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