



Exploring the costs of unsafe care in the NHS

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Executive Summary

Errors and “adverse events” impose real costs in all sectors: public and private, within households and communities. However, errors and mistakes that take place in the course of healthcare can have a particularly significant impact on the lives of those affected. Aside from the human impact, harm is also costly for the NHS, and often the wider public sector.

Frontier Economics has been asked by the Department of Health to provide a rapid review of evidence about the financial benefits of safer care.

Thinking about safe care and its costs builds on a number of reports published over the past decade or so. In 2000, the then Chief Medical Officer (“An organisation with memory”, DH) examined the costs of errors and adverse events at the time and actions that could be taken to reduce them. Most recently, the “Berwick review” noted that “*patient safety problems exist throughout the NHS as with every other health system in the world.*”¹

This report focuses on preventable adverse events which can be defined as an adverse event attributable to a specific error or errors. There are other ways of looking at safety and we discuss them in the main report.

The evidence can be divided into two groups: studies that calculate the cost of particular documented harms; and studies that take a representative sample of cases and investigate the extent of preventable harm across the sample. The former studies focus on specific instances (e.g. avoidable infection, medical errors) which can be added together to derive an estimate of the total cost of preventable adverse events. The latter studies estimates use samples of cases to estimate an overall rate of preventable adverse events (e.g. 5% of all admissions) which can then be applied more widely across the NHS.

The range of evidence examined in this report suggests a cost of preventable adverse events that is likely to be more than £1 billion but could be up to £2.5 billion annually to the NHS.

The current evidence base has limitations and this analysis has therefore focused primarily on setting out a range of plausible estimates, as well as identifying further sources of potential insight. It has erred on the side of caution in developing its conclusions.

¹ *An Organisation with a Memory*, 2000, http://webarchive.nationalarchives.gov.uk/+www.dh.gov.uk/en/Publicationsandstatistics/publications/publicationspolicyandguidance/browsable/dh_4098184 ; National Advisory Group on the Safety of Patients in England, “Berwick review into patient safety”, 2013 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226703/Berwick_Report.pdf

1 Background and definitions

Errors and “adverse events” impose real costs in all sectors: public and private, within households and communities. However, errors and mistakes that take place in the course of healthcare can have a particularly significant impact on the lives of those affected. Aside from the human impact, harm is also costly for the NHS, and often the wider public sector. For this reason, there are many instances where providing safe care in the first place is the most cost-effective approach to treatment. Indeed, putting in place systems and procedures to improve the safety of care might reduce the financial cost of care, as well as improve the quality of life for those who receive the appropriate treatment first time.

Frontier Economics has been asked by the Department of Health to provide a rapid review of evidence about the financial benefits of safer care and whether, based on that evidence, it is possible to provide an estimate of the costs borne by the NHS of care that proves to be unsafe.

A number of other reports have been published over the past decade or so looking at this issue. In 2000, the then Chief Medical Officer published “*An organisation with memory*” which examined the costs of errors and adverse events at the time and actions that could be taken to reduce them. Most recently, the “Berwick review” noted that “*patient safety problems exist throughout the NHS as with every other health system in the world.*”² The Review goes on to examine the causes of these safety problems and to make recommendations about how to avoid them.

Before discussing the current evidence, we define some of the terms more precisely. An Institute of Medicine Report sets patient safety within a broad spectrum of “patient care”.³ It states that patients should be free “from accidental injury”, then (moving along the spectrum of care) that the treatment they receive is consistent with current medical knowledge and best practice and, finally, that the treatment is responsive to their values, expectations and preferences. Taking account of that broader framework, safe care is part of the broader discussion about how to deliver the best care economically, effectively

² *An Organisation with a Memory*, 2000,

http://webarchive.nationalarchives.gov.uk/+www.dh.gov.uk/en/Publicationsandstatistics/publications/publicationspolicyandguidance/browsable/dh_4098184 National Advisory Group on the Safety of Patients in England, “Berwick review into patient safety”, 2013
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226703/Berwick_Report.pdf

³ Kohn, Corrigan and Donaldson “To Err is Human”, Institute of Medicine, 2000

and efficiently. Both Monitor and NHS England have set out the future challenge for the NHS and safe care plays one role in meeting that challenge.⁴

Gray (2003) develops a framework for thinking about safe care. In this framework:

- an “adverse event” is an injury caused by medical mismanagement;
- a “preventable adverse event” is an adverse event attributable to a specific error or errors; and
- a “negligent adverse event” is a preventable adverse event that satisfies the legal criteria used in determining negligence.

Figure 1 below sets out these definitions in a set of nested loops. Errors that do not result in adverse events are “near misses” and may not cause any harm to patients or financial consequences for the NHS. In addition, some adverse events may arise for reasons other than errors. However, by definition, all preventable adverse events involve an error and all negligent events are preventable. The box below provides just one example of the type of preventable adverse event that may occur.

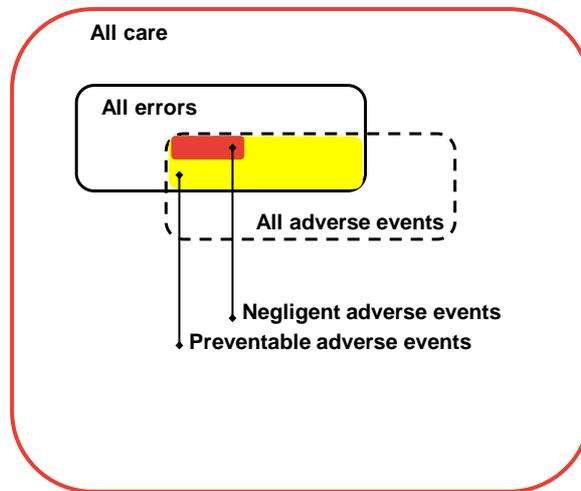
A preventable adverse event?

A 53 year old man with a history of stroke, resistant *staphylococcus* infection, leg ulcers and heart failure is admitted for treatment for leg ulcers and cellulitis on both legs. While in hospital he sustained two adverse events:

- 1- Failure to manage the leg ulcers aggressively led to the development of osteomyelitis. That resulted in having both legs amputated below the knee.
- 2- Incorrect management of his urinary catheter resulted in infection. The infection resulted in an additional stay in hospital of 26 days.

Source: Adapted from Vincent *et al* (discussed in detail in Section 2.2)

⁴ Monitor, “Closing the NHS funding gap” https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284044/ClosingTheGap091013.pdf ; NHS England, “The NHS belongs to the people” http://www.england.nhs.uk/wp-content/uploads/2013/07/nhs_belongs.pdf

Figure 1. Adverse events - taxonomy

Source: adapted from Figure 1 in Gray (2003)

Accurately estimating the extent of harm in healthcare settings is difficult. The 2014 “Review of Candour” conducted by Sir David Dalton and Prof Norman Williams concluded:

”We know that levels of reporting do not reflect the actual level of harm that occurs in healthcare ... for example primary care shows particularly low rates of reporting considering the level of activity in this sector. The National Reporting and Learning System (NRLS) receives around 1.4 million reports a year (including ‘no harm’ incidents), with around 75% from secondary care. On average, most studies have found that reporting systems only receive reports of around 7–15% of all incidents that are identified through more intensive retrospective review processes. ...For all these reasons it is clear that levels of reporting do not provide an accurate measure of the actual amount of harm that occurs in healthcare...”⁵

The limitations of reporting systems have led researchers to focus on two broad approaches to understanding both the extent and the costs of harm.

First, estimates based on the aggregation of the costs of particular harms. This approach works with those areas of harm that are known to be significant and which have data associated with them. There are methodological challenges from possible overlaps and from different ways of measuring the relevant harm and assessing the cost. We explore this approach in Section 2.1.

⁵ Sir David Dalton, Prof. Norman Williams ‘Building a culture of candour: A review of the threshold for the duty of candour and of the incentives for care organisations to be candid’ (<http://www.rcseng.ac.uk/policy/documents/CandourreviewFinal.pdf>)

Second, estimates based on case study reviews. This approach allows for a much more detailed consideration of the extent of harm in particular setting or group of settings. As such, it is likely to provide a truer picture of the real extent of harm in that setting or group of settings. The labour-intensive nature of this sort of research means that these studies are typically quite narrowly focused in terms of the locations they cover, and any generalisations from such studies can be methodologically challenging. We examine these estimates in Section 2.2.

Given the condition of the evidence base, this paper has used both approaches to assess the extent and cost of harm, drawing on studies of both kinds in developing its estimates.

Section 3 concludes by looking at wider efforts to improve productivity which could both lower (broadly defined) costs and reduce the proportion of preventable adverse events.

2 The cost of preventable adverse events

There are two possible approaches to estimating the cost of preventable adverse events:

- Aggregation of particular harms: add up the cost of each documented preventable adverse event to arrive at a total
- Detailed case reviews: estimate the proportion of all care that results in an adverse event from a suitable sample of cases and extrapolate to calculate an aggregate impact.

We provide estimates based on both of these methods in this section in order to better understand the possible range of costs associated with preventable adverse events. At the end of this section we bring the evidence together to provide conclusions about the cost of preventable adverse events.

2.1 Estimates based on the aggregation of particular harms

There are estimates of the costs of errors and preventable adverse events in particular areas of care. These estimates are disparate. They cover a wide range of different (and often unconnected) parts of healthcare system and different time periods. At the end of this section we consider how to bring them together but here we focus on documenting the range of evidence.

Figure 2 provides an overview of some of this evidence. The costs of preventable adverse events ranges from about £5m in costs that arise from drug-related medical errors to potentially up to £300m cost that arises from avoidable infections following orthopaedic surgery.

In some of these cases there are reasons to believe the costs could be significantly higher. For example, while the estimated cost of drug related medical errors is £5m, there are much larger costs associated with the fact that up to 50% of patients fail to complete their course of treatment as intended. NHS England estimates that 5% to 8% of unplanned hospital admissions are due to medication issues. Often the full course of prescribed drugs is not taken because of a failure to monitor and properly encourage and instruct patients. This, in turn, imposes costs because conditions are not properly treated and become more serious.⁶

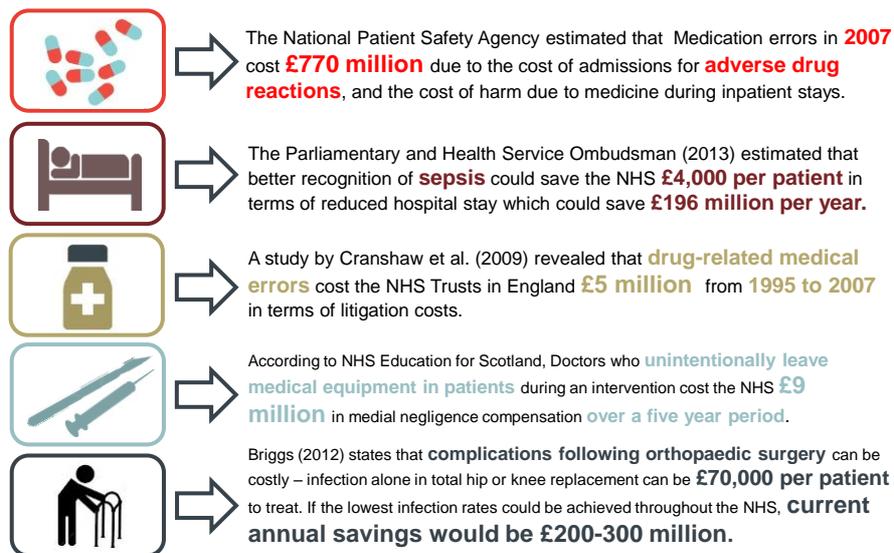
⁶ NHS England “Making medicines-taking a better experience” <http://www.england.nhs.uk/wp-content/uploads/2014/04/mo-ws-report-02-14.pdf>

A related, but distinct, issue relates to errors in the original prescriptions. One study examined 201,000 items dispensed by 14 community pharmacists in England and found a 0.75% error rate, of which about 5% to 32% of the errors could have caused harm.⁷

A simple sum of the aggregate harms in Figure 2 would suggest a harm approaching about £1.1 billion. However, it is important to note that the actual studies cover different time periods and draw on different data sets. Nevertheless, looking at the studies in the round brings out important facts:

- A range of issues related to prescribing and taking prescribed drugs impose very significant costs (which we discuss in more detail below); and
- Unnecessary infections continue to create costs despite significant progress over recent years.

Figure 2. Costs of preventable adverse events in various areas of healthcare



Source: various (as noted in the figure)

Various international studies also corroborate the specific findings above: preventable adverse events occur with sufficient frequency that they cause significant costs to patients and their families, as well as financial costs to providers. A range of studies quoted in Fray (2003) finds evidence of adverse

⁷ Hawksworth et al 1999

events ranging from about 1% of cases for the strictest definition of “negligent” adverse events to around 8% to 9% for “preventable” adverse events. The main UK based study has been undertaken by Vincent *et al* (2001) who find evidence of preventable adverse events in 5.2% of cases they examined in two English trusts.

In addition to these and other studies looking at the rates of adverse event, there is more widespread documentation of diagnostic errors – some of which are likely to lead to inappropriate care and preventable outcomes.⁸ Finally, some *ex post* studies of particular conditions suggest they could have been prevented. For example, one study of 118 cardiac arrest resuscitations in an English hospital suggested that about 62% of them were preventable.⁹

The Health and Social Care Information Centre (HSCIC) publishes data on the “NHS safety thermometer” which provides local health organisations with a way to monitor patient safety. It monitors several types of harm across all care settings (hospitals, community settings, nursing homes and others). Its latest report, covering the period from September 2013 to September 2014 indicated “harm free” care for about 94% of cases.¹⁰ That is consistent with the Vincent *et al* (2001) study in England which found estimates of preventable harm occurring in about 5% of cases.

More systematic studies have also confirmed that, at least in some instances, there are net benefits from putting in place measures to reduce these errors. For example, Elliott *et al* (2014) document a net reduction in cost (and improvement in quality adjusted life years) from measures put in place to reduce prescribing errors in general practice.¹¹ Related studies have documented the variation in primary care prescribing.¹² While this may not always result in “adverse events” as defined in the first section, they may result in unnecessary expense¹³. We discuss this issue in more detail in Section 3.

⁸ There is little evidence from the UK but various studies from the US suggest diagnostic error rates ranging from 10% to 15%. For example, Graff *et al* (2000) and Flum *et al* (2001)

⁹ Hodgetts *et al* 2002

¹⁰ HSCIC 2014; the Safety Thermometer monitors 4 very specific types of harm: pressure ulcers, falls with harm, catheters and urinary tract infections, new venous thromboembolisms. The definitions discussed in Section 1 above encompass a wider range of care but also focus on preventable harm.

¹¹ Elliott *et al* 2014

¹² Houten *et al* 2014

¹³ We are likely to see an increase in ‘polypharmacy’ in future years, and this added complexity has the potential to increase errors and related harm.

2.2 Case-study review based estimates

Estimates of this kind try to extrapolate from a sample of cases in order to estimate an overall impact on patients and the NHS. As noted above a number of studies have tried to estimate the proportion of all admissions that results in preventable adverse events. Our review of the literature identified only one peer-reviewed estimate for the UK. That study, undertaken by Vincent *et al* (2001) estimated that around 10% of all patients admitted to hospital suffered an adverse event, and that about half of those adverse events were preventable.

The Vincent *et al* study is based on a very detailed review of case files using expert clinicians (nurses and a consultant physician). They reviewed over 1000 patient records covering many specialties (general medicine, general surgery orthopaedic surgery, obstetrics). However, it is important to note that those records were drawn from only two London hospitals. The authors do not claim the results can be generalised more widely across the NHS. In particular, they note that the specialties examined could have higher rates of adverse events than a fully representative group of specialties across all cases in the NHS. Their results are broadly in line with the wider international evidence quoted in the previous section.

In 2012/13 there were 15.1 million finished consultant episodes for admitted patient care.¹⁴ Taking the Vincent *et al* estimate of the levels of preventable adverse effects for admitted care we can calculate an aggregate level of adverse events across the NHS in England. It would suggest that a total of 755,000 preventable adverse events (i.e. 5% of the total).

The same Health and Social Care Information Centre statistics suggest that the mean length of stay for an admitted patient was 5.2 days (median 1 day). The average cost of an inpatient stay was about £3,366 according to the latest reference cost data.¹⁵ If those admitted for preventable adverse events stay the same length of time as the average that would suggest an annual cost of about £2.5 billion (i.e. £3366 times 755,000 cases).

As is apparent from the calculation, this £2.5 billion figure is an extrapolation based on the available evidence. Given the uncertainty around the evidence, a number of sensitivities can be performed to understand how the cost varies under different scenarios. Table 1 provides a set of scenarios, others could also be examined as part of wide work on this topic.

¹⁴ Health and Social Care Information Centre, Hospital Episode Statistics for England, Inpatient Statistics, 2012/13.

¹⁵ Monitor Reference Costs, 2012-13, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/261154/nhs_reference_costs_2012-13_acc.pdf

The cost of preventable adverse events

Table 1. Cost of preventable adverse events - alternative scenarios

Scenario	Cost of preventable adverse events (annual)
Base case: sample evidence of 5% preventable adverse events at average inpatient treatment cost per adverse event (see above text)	£2.5bn
Adverse events result in 5 to 10 additional excess bed days for someone already in hospital *	£1bn to £2.1bn
Preventable adverse events are 25 % to 50% lower on average than in the particular specialties examined by Vincent <i>et al</i>**	£1.3bn to £1.9bn
Preventable adverse events are 25% to 50% higher on average than in the specialties examined by Vincent <i>et al</i>***	£3.2bn to £3.8bn

Source: see detail of calculations below.

Calculations:

Base case = product of [5% (from Vincent *et al*) of 15,100,000 cases of admitted patient care in 2012/13 (last year of full data from HSCIC)] and [£3,366 average cost of inpatient care]. The average cost of inpatient care includes costs associated with litigation (including pay-outs).

*: product of [5% (from Vincent *et al*) of 15,100,000 cases of admitted patient care in 2012/13 (last year of full data from HSCIC)] and [5 or 10 excess bed days to establish each end of the range] and [£273 cost of an excess bed day based on Monitor 2012/13 Reference Costs]

** : The same as the base case but the 5% level of preventable adverse events from Vincent *et al* is scaled down by 25% (to 3.75%) and 50% (to 2.5%) to establish new range.

***: The same as the base case but the 5% level of preventable adverse events from Vincent *et al* is scaled up by 25% (to 6.25%) and 50% (to 7.5%) to establish new range.

The lack of systematic evidence about preventable adverse events means that there is uncertainty over such top-down estimates. However, the evidence that is available and the scenarios presented above make it clear that:

- even under very conservative scenarios there may be significant costs associated with preventable adverse events – about £1.3bn even if the level of such events is only half of that indicated in Vincent *et al* (as calculated in Table 1) and about £600 million even if levels are only a quarter that reported by Vincent *et al*;

- under alternative scenarios costs could rise above £3bn a year.¹⁶

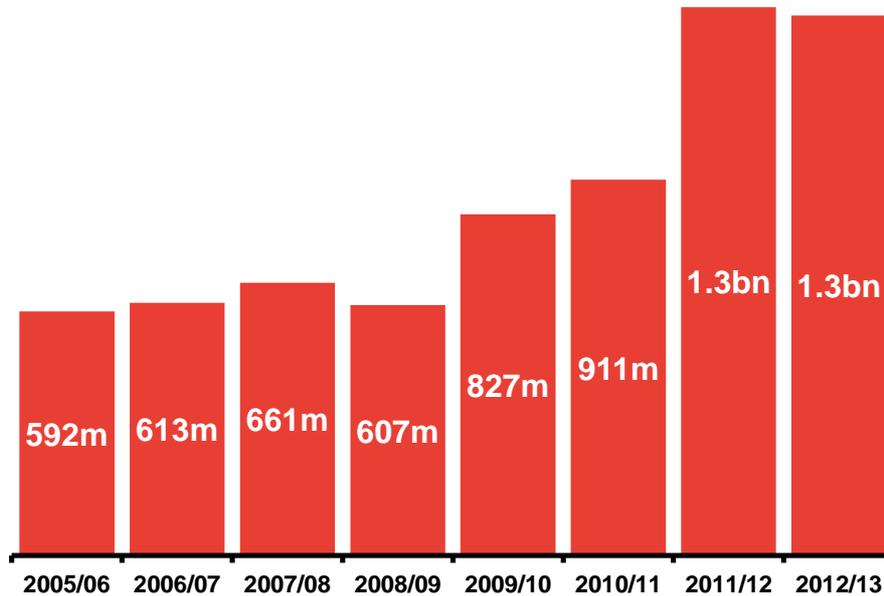
A further perspective on cost is provided by the level of claims paid out as a result of litigation by patients and their families for problems that arose while they were being cared for by the NHS. The NHS Litigation Authority handles such claims and keeps a record of the level of claims each year. These are presented in Figure 3.

Annual pay-outs increased steadily from about 2008/09 until the most recent years for which data is available. The trend is likely to reflect a range of factors. An increase in preventable adverse events may only be one factor (see Figure 1 for the distinction between preventable and negligent adverse events). However, these figures may suggest a lower bound on the level of preventable adverse events because they reflect only those preventable adverse events that meet the legal tests for a pay-out by the NHS. That would suggest a lower bound estimate of about £1bn per year.¹⁷ That is in line with the other top-down estimates and scenarios presented in Table 1.

¹⁶ For example, Vincent *et al* note that patients with adverse events were older than those who did not experience adverse events. Older patients are likely to stay longer and need more intensive care following an adverse event than others.

¹⁷ The value of claims fell slightly from £1.33 billion to £1.31 billion between 2011/12 and 2012/13. However, the precise level of claims paid in any one year also depends on when cases are settled, as opposed to when the harm occurred, so longer term trends are likely to be more indicative of whether negligent adverse events are rising or falling.

The cost of preventable adverse events

Figure 3. Pay-outs by NHS Litigation Authority

Source: NHS Litigation Authority

2.3 Summary

Taken together, the evidence from the different approaches suggests that preventable adverse events cost the NHS a significant amount of money. The evidence suggests that the costs of unsafe care are likely to be more than £1 billion per year but could be up to £2.5bn. For example, the National Patient Safety Agency estimated that adverse drug reactions caused £770 million in costs to the NHS alone in 2007 (see Figure 2). Clearly not all of these may have been preventable but there are many other specific instances documented in Figure 2. Together these are likely to exceed £1 billion per year.

At the upper end of the range, estimates in excess of £2.5 billion are not unreasonable. For example, the current (limited) evidence based on medical case reviews to document preventable adverse events may have underestimated their prevalence because authors have employed conservative approaches to classifying such events.

There have been improvements in quality and safety in the NHS since the original Vincent *et al* study. For example, the NHS has made progress in reducing harm related to hospital acquired infections, and there appears also to

have been more recent progress in relation to the ‘safety thermometer’ harms¹⁸. This may mean that the level of preventable adverse events has decreased since the Vincent *et al* study.¹⁹ With limited more recent evidence, a range of estimates is the most robust way of presenting the current estimates.

The evidence base as it stands does not offer detailed insight into whether there are any (e.g. upfront or net) costs associated with realising these gains. The Berwick Review, quoted at the outset of this report, concludes that: “*The NHS in England can become the safest health care system in the world. That will require unified will, optimism, investment, and change.*”(page 6, emphasis added)²⁰ Some evidence suggests that improvements can be made at very little cost. For example, a redesign of prescription pads as part of work by the Behavioural Insights Team was found to significantly reduce errors associated with the incorrect doses in a study by Imperial College.²¹

It is beyond the scope of this review to consider the net impact of safety improvements. However, if we consider the wider potential to increase productivity in the NHS, alongside safety improvements, then the upper end of the range (even on a net basis) may be considerably larger than indicated by this analysis. We turn to that in the next section.

¹⁸ For hospital acquired infection data see http://www.ons.gov.uk/ons/dcp171778_276956.pdf and <http://www.ons.gov.uk/ons/rel/subnational-health2/deaths-involving-mrsa/2008-to-2012/stb---mrsa.html>. For safety thermometer data see <http://www.hscic.gov.uk/searchcatalogue?q=title%3A%22nhs+safety+thermometer+report%22&area=&size=10&sort=Relevance>

¹⁹ No single factor appears well correlated with the overall improvement in care over recent years. The following options were considered:

- Changes in mortality rates. There are difficulties defining the appropriate baseline. Recent improvements in coding make comparisons with earlier data problematic, and so it is difficult to generate a reliable ‘rate of change’.
- Levels of safety reporting. This is not a reliable indicator over the long term, as rises in reporting might indicate a larger number of safety incidents, but they may well also indicate a greater focus on safety issues.
- More recent case note review studies. A study by Hogan *et al* is more recent but focused on deaths rather than adverse incidents.

²⁰ National Advisory Group on the Safety of Patients in England, “Berwick review into patient safety”, 2013 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226703/Berwick_Report.pdf

²¹ http://www.behaviouralinsights.co.uk/sites/default/files/BIT%20Publication%20EAST_FA_WEB.pdf

The cost of preventable adverse events

3 Productivity, effectiveness and safe care

This report is primarily focused on estimating the cost of preventable harm to the NHS. What counts as ‘preventable’ is not fixed, and it is likely that more could be done to develop new ways of preventing poor care and the waste of resource it entails, and of spreading existing successful strategies for tackling harm and improving productivity.

It is not within the scope of this report to model the potential for expanding the NHS’s ability to tackle the waste represented by poor care. It can be hard to distinguish work to tackle productivity from work to improve quality and safety. Although it was not possible to build a model of the potential impact of such changes as part of this work, it is possible to provide some examples of how NHS organisations and healthcare organisations in other countries have tackled these issues, including the ways in which strategies to improve quality and safety can also be cost-effective.

A very wide range of measures will be required to increase the productivity of the whole NHS in order to meet future challenges.²² Monitor, among others, have set out the range of areas where action is required. Many of those touch on issues of safety and of where improvements to safety also improve productivity.

Monitor identifies four areas of opportunity for increasing productivity to meet the funding gap:²³

1. **Improving productivity within existing services:** this involves a range of actions many of which would also improve safety. They include reducing lengths of stay, better collaboration with social services and avoiding drugs and procedures of low clinical value. Monitor estimate these (and other related) actions could save the NHS between £6.5 billion and £12.1 billion annually by 2021.
2. **Delivering the right care in the right setting:** Monitor emphasises that “*many patients could enjoy better outcomes at lower cost to the NHS if care were delivered in a more appropriate setting*”.²⁴ This includes a range of measures that would reduce the need for hospital attendances (and associated risks of infection), as well as concentrating more specialist care to improve

²² For example, the Nuffield Trust suggests a funding gap of about £30 billion per year for the NHS by 2021 (“A decade of austerity?”, 2012 http://www.nuffieldtrust.org.uk/sites/files/nuffield/121203_a_decade_of_austerity_full_report_1.pdf)

²³ Monitor, “Closing the NHS funding gap”, 2014 - https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284044/Closing_TheGap091013.pdf

²⁴ *Ibid*, page 2

outcomes (and help reduce adverse events). Monitor's review of the evidence suggests this could save the NHS £2.4 billion to £4 billion per year by 2021.

3. **Developing new ways of delivering care:** Monitor suggests more could be done to draw on international best practice and wider innovations to improve care over-and-above the improvements from the previous two categories. Monitor provides a conservative estimate of additional savings of between £1.7 and £1.9 billion.
4. **Allocating spending more rationally:** Monitor suggests that redirecting existing spending to focus more on prevention and early diagnosis (among other things) could result in significant productivity gains. Such changes are also likely to improve safety since they may help to avoid some episodes of care altogether, thereby reducing the attendant risk of adverse events. Monitor does not quantify the value of such changes but focuses on the importance of commissioners in making the required changes.

Overall the analysis undertaken by Monitor identifies £10 to £18 billion of annual savings (by 2021) from productivity gains. Many of these savings would also reduce the number of adverse events or the severity of adverse events when they do occur.

The work by Monitor is supported by a much wider literature on improving healthcare productivity and the associated impact on safety. For example, Eichely *et al* (2014) document the benefits that arise from having GPs working beside A&E departments. They report lower costs based on a pilot study, as well as better patient experience which may also be related to safety (e.g. more efficient diagnostic testing, reduced process times). Another study by Adams *et al* (2014) evaluated a new approach to improve discharge planning. The evaluation examined the performance of a rural hospital in the US operating the new system. It resulted in reduced readmissions (which may be linked to concerns about adverse events) and positive feedback from patients and families.²⁵

National and international evidence suggests considerable opportunity for productivity gains. The amounts presented by independent NHS regulatory authorities are much higher than the calculations from the previous section based solely on estimating the number and cost of preventable adverse events. Clearly the total gains from these productivity improvements cannot be solely attributed

²⁵ This latter study is also an illustration of the complexity of this issue. Work by Laudicella *et al* (2013) suggests that readmission rates may not be an indicator of poor care (e.g. where hospitals are treating very difficult cases who require readmission to avoid worsening outcomes). Indicators of safe care, and what constitutes an adverse event, need to be chosen carefully. Fully understanding this issue is beyond the scope of this work but very important in light of the financial challenges facing the NHS and developing the best, safest, measures to address it.

to safer care. Nevertheless, the evidence-base presented as part of these estimates illustrates the possibility of improving safety alongside significant financial savings.

This work does not seek to model the potential gain in value, outcomes or finances of interventions to improve care. Some existing studies do suggest that it may be possible to improve care and reduce costs. They suggest that there may be significant gains for the NHS from applying a range of different measures. We have subdivided the studies into four broad categories suggested by the Department of Health (which map to the Monitor categories)²⁶.

1. **Service redesign for productivity.** While these studies are focused on productivity issues, they can also be seen as of benefit to patients in terms of safety and experience by, for example, reducing time spent in hospital.
2. **Right care, right time, right place.** Sometimes thought of in terms of ‘care closer to home’, the approaches highlighted in this category offer patients a better service and can be more efficient when they match need more closely with service.
3. **Patient enablement/patient centred care.** Giving patients more control and capability in relation to their own care can be a tremendous help to safer care, and better value.
4. **Safety.** While these studies are focused on safety, there are clear financial benefits as well.

3.1.1 Service redesign for productivity

A number of productivity studies show how changes to processes can reduce length of stay and tackle other issues relevant to patient safety and well-being. One New Zealand hospital managed to reduce average length of stay by 14%. Staff engagement was central to securing the improvements in processes that meant patients spent less time in hospital²⁷. A US study showed how one hospital improved its discharge planning so that readmissions reduced by 27% from baseline, with patients and families reporting positive results for them – in one sense this was ‘pure productivity’ but it was also about improving outcomes and experience²⁸. Two English studies also show positive outcomes for older people through better management of emergency admissions. In the first study, the use of seven day working, a frailty unit and improved discharge planning showed a 20% reduction in the relative risk of hospital mortality without

²⁶ Many of these studies can be found on the Health Foundation website, which provides an excellent set of resources focused on quality improvement

²⁷ Toomath et al, 2014.

²⁸ Adams, et al 2014.

requiring additional resources²⁹. The second study looked at how a triage system could reduce avoidable emergency admissions and shorten length of stay, reporting an 18% reduction in length of stay³⁰. A good illustration of the close relationship between productivity initiatives and the importance of staff engagement focused on quality can be found in the Health Foundation's work on 'Flow'³¹.

3.1.2 Right care, right place, right time

There are a number of studies that explore the potential of out-of-hospital care, with promising results in terms of cost and effectiveness. A New Zealand review of nocturnal and daily home haemodialysis found that this approach had the potential to produce cost savings while being more effective for patients³². An Australian study of 'hospital at home' found that there were cost reductions, improvements in patient satisfaction and no negative impact on clinical outcomes³³. An observational study of an integrated care pilot in England showed some promising results for both systems and patients³⁴.

3.1.3 Patient enablement / patient-centred care

Studies of this kind are often seen primarily in terms of quality and safety improvements, but there are a number which also show evidence of cost savings as well.

A recent study of self-care in relation to asthma in England showed an increase in medicine adherence and reductions in unplanned health service use. Interventions to actively engage patients were particularly effective³⁵. A Dutch study of active follow up of people with long-term conditions by community pharmacies showed cost-effectiveness for some conditions, and reduced discontinuation of treatment³⁶. A US study of post-discharge coaching showed a reduction of both service use and costs with no costs shifted to other services³⁷.

²⁹ Silvester et al, 2013.

³⁰ Wright et al, 2013.

³¹ Health Foundation, *Improving patient flow*, 2013.

³² Walker et al, 2014.

³³ Varney et al, 2014.

³⁴ Bardsley et al, 2013.

³⁵ Denford et al, 2013.

³⁶ Van Boven et al, 2014.

³⁷ Gardner, et al, 2014.

3.1.4 Safety initiatives

The focus in this section is on studies which focus on safety but also on financial benefits.

A recent US systematic review showed that there was evidence that the following areas were promising candidates for economically attractive patient safety improvements:³⁸

- keystone ICU intervention for central line-associated bloodstream infections;
- chlorhexidine for vascular catheter site care; and
- standard surgical sponge counts.

A recent cost benefit analysis of the use of the surgical safety checklist in New Zealand concluded that more systematic use of the checklist was likely to lead to observable reductions in complications at a cost that under all credible assumptions was likely to provide a net financial benefit³⁹. A 2009 study modelling the cost-effectiveness of interventions to reduce medication errors showed strong cost-effectiveness⁴⁰. Some studies, such as a recent Australian investigation of the cost-effectiveness surgical site infection prevention following total hip arthroplasty, can identify interventions which it does not make sense to pursue as well as more promising strategies⁴¹.

3.1.5 Conclusion

The illustrative studies cited in this section suggest there are interventions that provide financial benefits alongside improving the safety of care.

³⁸ Etchells et al, 2012

³⁹ Hefford and Blick, 2012.

⁴⁰ Karnon et al, 2009.

⁴¹ Merollini et al, 2013.

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