

Protecting resources, promoting value: a doctor's guide to cutting waste in clinical care

November 2014

Foreword

I warmly commend this Academy report, 'Protecting resources, promoting value - a doctor's guide to cutting waste in clinical care'.

Maintaining NHS services may depend on doctors engaging with this issue to an extent that has not previously been the case.

As this report spells out avoiding waste and promoting value are about the quality of care provided to patients – which is a doctor's central concern.

One doctors' waste is another patient's delay. Potentially, it could be that other patient's lack of treatment.

Protecting resources and promoting value is therefore important at any time. When resources are increasingly constrained - and likely to become more so in the future – this becomes a necessity.

There is a clinical cost to wasted resources and also, as the report shows, a cost to the environment.

But this is not simply about costs.. It is about supporting doctors and other clinicians to ensure that the resources of the NHS are used in the most effective way possible to provide the best possible quality and quantity of care for patients.

I hope you will agree that this report gives many examples of how this can be done and we hope that this is taken up by doctors, clinicians and managers at local level.

The Academy is planning to continue work in this area through championing work on "Choosing Wisely" which promotes the identification of tests or procedures whose necessity should be questioned and be the subject of discussion between individual clinicians and patients.

The Academy is a four nation body and we are absolutely clear that the implications and recommendations apply equally in the NHS in all four nations of the UK. We hope they are taken up with equal vigour in all four countries.

I would like to thank all those who contributed to this report whether on the Expert Reference Group or separately. Finally I would particularly like to thank Daniel Maughan and James Ansell for their truly excellent work in writing this report



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Protecting resources, promoting value: a doctor's guide to cutting waste in clinical care

06	Executive summary
08	Recommendations
09	Contributors
	Section 1
	Doctors as leaders in reducing clinically related waste
11	Introduction
12	Patient journey
	Section 2
	Waste: a critical perspective
23	How waste affects the value of health care services
25	An academic overview of the different types of waste
27	Reducing waste; the 'Lean' approach
	Section 3
	Waste: a clinical perspective
29	Doctors as leaders in maintaining quality of care
30	A doctor's focus on waste
40	A patient's perspective
43	Waste in biomedical research and medical training
	Section 4
	Focus on waste in diagnostics
45	Optimising laboratory test requests
47	Dilemmas in imaging; a narrative
48	Reducing waste in radiology: a success story
49	Challenges for doctors in reducing waste in diagnostics
	Section 5
	The current health care context
51	Constraints
53	Can integrated care models reduce waste?
54	Current initiatives that may help you reduce waste in health care
56	References
60	Calculations

Executive Summary

Health care in the UK faces a future of increasing constraints. Serious challenges exist that threaten the sustainability of services. To preserve the standards of care provided across the NHS, waste must be reduced. Most people think of waste in a product sense (e.g. why are we throwing that away when we didn't need to open the pack?). However, most waste in the NHS lies within clinical practice and models of care. Low value services and unnecessary use of clinical resources undermine the sustainability of high value care and hinder the development of new interventions.

This report provides a framework for a way in which doctors can think critically about waste from a clinical perspective and provides examples of doctors improving the value of health care by reducing waste. Estimates suggest that around 20% of mainstream clinical practice brings no benefit to the patient as there is widespread overuse of tests and interventions¹. Investigations, medications, hospital beds, and theatre time are clinical resources that are wasted if not used appropriately to maximise value for patients. If the finite NHS resources are spent on costly interventions that have little benefit, then the service we provide will be of little value and the resources we have will be wasted. The key is to focus on minimising waste in all its forms. By doing this, value, and therefore good health outcomes, is maximised.

How reducing waste leads to higher value care

A doctor's primary motivation for reducing waste is that it enables the savings to be used more effectively elsewhere. This process creates a higher value health care system where resources: cash, carbon and staff time, are released from some parts of the system to develop new services or support struggling services. Reducing waste in today's climate of constrained resource is really about creating the health care system that we want to have. It is not just about cutting corners or reducing spending. As responsible stewards, doctors can provide a more effective use of constrained economic and environmental resources.

A cultural shift is required which calls upon doctors and other clinicians to ask, not if a treatment or procedure is possible, but whether it provides real value to the patient and genuinely improves the quality of their life or their prospects for recovery. In other words, don't do something because it can be done, do it if it is necessary.

There are many influences that affect how a doctor uses clinical resources including individual practices, defensive practices, time pressures, and responding to senior or patient pressures among others. Many of these factors can lead to an overuse of resources. The cultural shift required, will value the targeted use of clinical resources to provide greatest benefit to the patient.

This report does not attempt to provide a summary of how much money can be saved in the NHS nor does it attempt to provide yet more guidance for doctors. Rather, this report provides evidence for the benefits that doctors can achieve by tackling waste in the clinical domain, leading to improved patient care, improved outcomes and a reduced use of resources. Realignment of clinical decision-making is required – where patient benefit and patient preference are balanced against patient harm and resource usage. Performing the right test or procedure at the right time is fundamental to reducing waste in clinical decisions. Dissemination of best practice is key, alongside local agreement to adopt best practice guidelines. A culture of 'find the best way of doing something and do it everywhere' will certainly lead to less waste of clinical resources.

The carbon cost of wasted resources

The World Health Organisation have stated that climate change is the largest threat to human health in the 21st Century and the NHS remains the largest single contributor of greenhouse gases in the public sector. Most of these emissions come not from heating or lighting clinics or hospitals, but directly from clinical practice. Reducing waste in the clinical domain has a triple imperative; it improves value, lowers costs and reduces CO₂ emissions. A good example of this is a project that provided specialist geriatric services within nursing and residential homes, which led to a reduction in unplanned admissions. This initiative improved care and saved the Trust £65,000 and 23 tonnes of carbon in one year.

What is included in this report

A patient journey is included that demonstrates wasted clinical resource in the community and in hospital settings. Another section provides doctors with a framework for reducing waste in their clinical practice, this is called the '**waste reduction toolkit**'. A focus is provided on waste in diagnostics, this section provides an overview of national initiatives that have reduced waste in laboratory and radiology tests. Recommendations are provided to support the reduction of waste in clinical settings. Royal Colleges can lead the way by developing tools for doctors to help them reduce waste and by promoting this agenda through supporting initiatives such as '**Choosing Wisely**'² or the NICE '**do not do**' recommendations database³. Developments in medical training and revalidation also need to reflect this broader doctor's role.

Recommendations:

1. Doctors should embrace the values of resource stewardship in their clinical practice and use the **waste reduction toolkit** provided in this report to maximise the value of every intervention.
2. Medical Royal Colleges and specialist societies should establish mechanisms to identify the areas of waste within their specialty and provide leadership in tackling them using tools such as:
 - a. The NICE 'do not do' recommendation database
 - b. A 'Choosing Wisely' list of low-value interventions for their specialty
3. Local Education and Training Boards, deaneries and medical schools should support the development of clinical and leadership skills for high value care, see Box on page 17.
4. NHS organisations across the UK should provide doctors with the appropriate time and support to review their clinical practice to find areas where they can reduce wasted resource.
5. Health Commissioners should encourage the reduction of waste in clinical processes.
6. Public health authorities across the UK should create and support initiatives that reduce wasted resource in clinical settings.
7. All those working in health should take steps to increase their understanding of the carbon costs of health care activities.

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Section 1

Doctors as leaders in reducing clinically related waste

Introduction

The “NHS belongs to the people”, a report produced by NHS England in 2013 states that despite positive initial savings over the past two years,

“without bold and transformative change the NHS will become financially unsustainable, the safety and quality of patient care will decline”⁴

Corporate management has been largely responsible for waste reduction in health care for too long. In primary care, wards, clinics and theatres, there are many types of waste that cannot be tackled without medical expertise. Investigations, medications, hospital beds and theatre time, are all resources that doctors use on a daily basis.

Deciding how and when to use these resources are clinical questions that can only be answered by those with sufficient training and experience. Waste arises from using these clinical resources inefficiently or unnecessarily. Inappropriate use of clinical resources is waste and this waste relates directly to clinical practice and needs to be tackled by those best equipped to do so; doctors.

Frequent responses to these constraints on health care include reducing staffing numbers or cutting valued services. A more sustainable strategy would be first to reduce the waste that exists throughout the NHS. **The comprehensive tackling of waste within clinical areas would create resource for other services to keep running.** Investing in high value services or treatments that prevent the development of future health conditions and lead to improved health outcomes is crucial. While preventative medical practice certainly improves the value of NHS services it is not discussed in this report. Rather, this report focuses on doctors' reducing clinical resource use in existing clinical services.

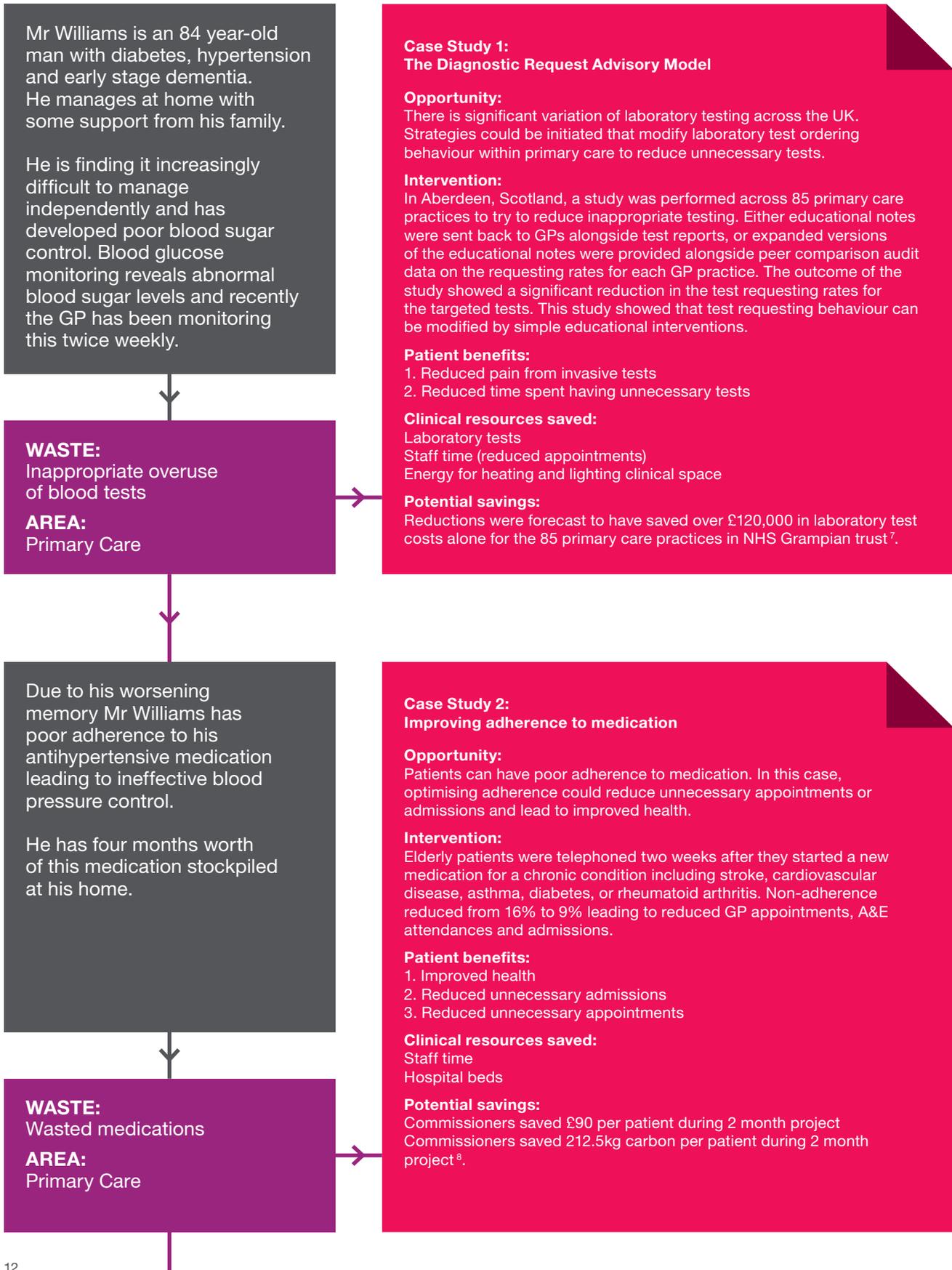
Estimates suggest that around 20% of mainstream clinical practice brings no benefit to the patient¹. A report in 2010 estimated the cost of prescribed medicines wasted to be around £300 million each year⁵. Given this level of wasted resource and the cuts being made to health care budgets, the concept of resource efficient health care needs to lie at the heart of clinical practice.

This report provides an Academy response on behalf of doctors to the constraints facing health care services. It includes examples of doctors acting as responsible stewards of clinical resources and creating initiatives that directly reduce waste. Reducing waste is not a new concept for doctors, but this report calls for a more coherent and widespread response from doctors to actively reduce waste in their daily clinical practice.

“Whatever your role or level in your organisation... you should be willing to demonstrate leadership in managing and using resources effectively. This means that you should be prepared to contribute to discussions and decisions about allocating resources and setting priorities in any organisation in which you work”

GMC: Good medical practice⁶

Patient journey



He reduces his fluid intake over a few days and due to being prescribed diuretic medication quickly becomes dehydrated.

This leads to him falling over in his home. An ambulance is called by a family member who finds him 2 hours later.

WASTE:
Avoidable admission
AREA:
Primary Care

Case Study 3: Improving prescribing practice

Opportunity:

Adverse drug reactions (ADRs) have a major impact on the health of the population, they account for 6% of all hospital admissions. Adverse drug reactions commonly result in falls, sedation, and cognitive impairment.

Intervention:

A medication review tool was developed, (based on the evidence based 'Screening Tool of Older Persons' potentially inappropriate Prescriptions' (STOPP) screening tool), for routine use with elderly patients. Use of this tool led to 52% of patient's having their medications either reduced or discontinued.

Patient benefits:

1. Reduced adverse reactions
2. Reduced admissions

Clinical resources saved:

Medication
Hospital beds
Staff time

Potential savings:

4 in 100 hospital bed days are caused by ADRs across the UK. Eliminating adverse drug reactions could save up to £466 million a year nationally by reducing bed days alone. Reducing 4 in 100 hospital bed days would save 590 tonnes carbon per year across the UK nationally⁹.

From the emergency department Mr Williams is admitted to an acute medical ward. He is treated for dehydration. Due to some initial confusion about the responsible clinician it takes 2 days before his consultant reviews him.

The consultant discovers bruising over his right hip and requests an X-ray. A delayed diagnosis is made 2 days after admission, as a fractured neck of femur is discovered on X-ray.

WASTE:
Prolonged admission
AREA:
Acute Medical Care

Case study 4: Improving the quality of ward rounds in acute care

Opportunity:

Increased consultant input in acute medical care can reduce length of stay in hospital.

Intervention:

The Royal Liverpool University Hospital replaced twice-weekly with twice-daily ward rounds on two medical wards. This simple change resulted in doubling the number of discharges, halving the average length of stay and reducing bed occupancy by 7.8%.

Patient benefits:

1. Reduced length of admission
2. Care received from more experienced doctors

Clinical resources saved:

Hospital beds
Staff time

Potential savings:

If this level of reduction could be achieved across all wards at the Royal Liverpool University Hospital, with subsequent reductions in number of beds, then the savings that could be achieved are: £11.7 million per year and 1,900 tonnes carbon per year¹⁰.

Patient journey (continued)



Following this review, the decision is made for Mr Williams to be discharged to a residential home.

After being discharged, he develops confusion and becomes difficult to manage at his new residence. He is reviewed by his GP who decides readmission is necessary.

WASTE:
Avoidable admission
AREA:
Integrated Care

Case Study 7:
Improving access to specialist care

Opportunity:

Nursing home residents need specialist care to manage their needs but often cannot get this in the community. Many therefore are admitted to hospital, often with long lengths of stay.

Intervention:

Ashford and St Peter's Hospitals NHS Trust worked in partnership to support staff in nursing homes and local GPs. Consultant geriatricians held monthly meetings with nursing home managers and relevant GPs at the nursing home. A telephone advice line was created alongside the option of administering intravenous antibiotics and fluids onsite. An email alert system informed the consultant geriatricians whenever a resident from one of the nursing homes was admitted. The trust achieved a 35% reduction in hospital admissions from 12 nursing homes; a reduction of 250 bed days (at £260) in one year.

Patient benefits:

1. Improved access to specialist care
2. Reduced admissions
3. Care closer to home

Clinical resources saved:
Hospital beds

Potential savings:

£65,000 saved by the Trust in one year 23 tonnes of carbon saved by the Trust in one year¹³.

Table 1 Costs from the patient journey



Avoidable
resources used



Financial cost



Environmental cost

Four months of wasted medication	£34 ³	15 kgCO ₂ e ²
Ambulance call	£235 ¹	68 kgCO ₂ e ²
First admission	£1713 ¹	446 kgCO ₂ e ²
Hip replacement	£5485 ⁵	Unknown
Psychiatric review	£430 ¹	97 kgCO ₂ e ²
GP review	£41 ¹	18 kgCO ₂ e ²
Second admission	£1713 ¹	446 kgCO ₂ e ²
Total	£9,651	1090 kgCO₂e

1 = data obtained from Curtis report¹⁴.

2 = data obtained from the Sustainable Development Unit for Public health and NHS England¹⁵

3 = data obtained from the office for national statistics¹⁶ (The average net ingredient cost per prescription item is £8.52 in 2012)

4 = data obtained from government statistics: <https://www.gov.uk>

5 = figure obtained from the Royal College of Pathologists

Table 2 Costs of clinical resources



Cost of clinical
resource



National average
Financial cost



National average
Environmental cost

Cost per admission in general hospital	£1713 ¹	446 kgCO ₂ e ²
Cost per consultant outpatient contact	£135 ¹	56 kgCO ₂ e ²
Cost for outpatient psychiatric assessment	£145 ¹	39 kgCO ₂ e ²
Cost for one bed day for adult mental health inpatient	£430 ¹	97 kgCO ₂ e ²
GP cost per 11.7 minute patient contact	£45 ¹	66 kgCO ₂ e ²
Prescription cost per GP consultation	£41 ¹	18 kgCO ₂ e ²
Average cost per prescription	£8.52 ⁴	4 kgCO ₂ e ²
Cost of MRI scan with contrast	£187 ⁴	Unknown
Cost of CT scan with contrast	£87 ⁴	Unknown
Cost of blood tests	Highly variable between regions but £10 is reasonable estimate ⁵	Unknown
Cost of ambulance call out	£235 ¹	68 kgCO ₂ e ²
Cost of medical instruments in England	£4.6 billion/year ²	2.2 million tonnes CO ₂ /year ²
Acute sector energy use in England	£500 million/year ²	2.5 million tonnes CO ₂ /year ²

1 = data obtained from Curtis report ¹⁴.

2 = data obtained from the Sustainable Development Unit for Public health and NHS England ¹⁵

3 = data obtained from the office for national statistics ¹⁶ (The average net ingredient cost per prescription item is £8.52 in 2012)

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5 = figure obtained from the Royal College of Pathologists

There are many examples of wasted resource in the NHS, but we suggest a focus on three core areas. These areas are applicable across clinical contexts, are causes of large amounts of waste in health care and can be approached by doctors at any training level or specialty.

The three areas to focus attention on are:

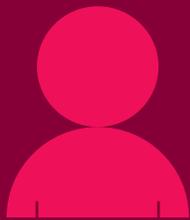
1. **Overuse of medication**
2. **Overuse of diagnostic or monitoring tests or procedures**
3. **Unplanned admissions**

Box 1 Fundamental attributes of a value-promoting doctor



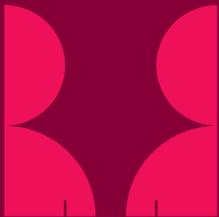
A skilled diagnostician:

forms intelligent differential diagnoses and can discern which investigations are truly necessary to diagnose and treat the patient effectively.



Patient-centred:

skilled in eliciting patients' needs and expectations, understands the family and social context, skilled in supporting patients to understand and co-manage their conditions.



A good collaborator:

has a good understanding of the care system within which they are working, enabling them to efficiently access the most appropriate care for their patients



An agent of change:

takes active part in shaping care systems to improve value



A focus on health:

recognises and has skills to act upon opportunities to promote healthy behaviours



Section 2

Waste: a critical perspective

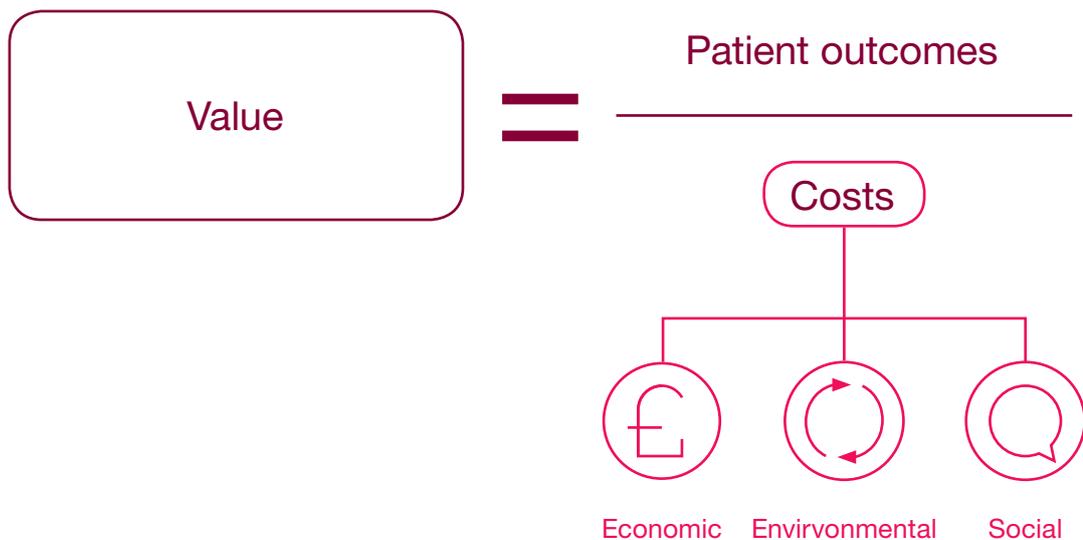
How waste affects value of health care services

In health care, waste and value are closely related. In fact, there is a direct link. Waste, put simply, is the opposite of value. Where waste is high, value is low and *vice versa*. Waste in this sense can be viewed as anything that does not add value.

Prioritising waste reduction therefore, is in fact, prioritising value.

Doctors need to recognise this relationship, as high value services will never be created without a strong emphasis on waste reduction. In healthcare, highest value can be defined as meeting patient expectations or providing the desired outcomes for the least cost^{17,18}. Costs of treatments in their broadest sense relate not only to economic costs but also the environmental and social costs for a given service or intervention, see Figure 1 below¹⁹. There are two ways to increase the value of an intervention. First, patient outcomes can be improved, and second, costs can be reduced. A high value intervention meets patient expectations at minimal cost.

Figure 1. Redefining value for health care



An example of this might be treating gastro-oesophageal reflux disease with an off-patent proton pump inhibitor, (off-patent means the original manufacturer's patent has expired and less expensive generic forms of the medication can be produced). This is a cheap, effective way to reduce symptom burden and disease progression. Prescribed at the minimum required dose, this medication is a high value intervention with little potential waste associated. Better yet, an initial intervention in this case could be lifestyle modification. Losing weight, reducing alcohol intake and stopping smoking all act to reduce symptoms and also lead to improved physical health. Therefore, potentially the patient might require no medication. This serves to illustrate the likely resource savings that could be achieved from greater investment in public health initiatives.

In contrast, waste can be seen as any intervention that does not entirely meet patient expectations or provide the desired outcomes. An example of this might be treating a patient who has a mild depressive illness with an antidepressant tablet. In 2011 the antidepressants had the largest increase in cost compared with any other medication group¹⁶. Evidence suggests that antidepressants are not effective in mild depression, rather, support and psycho-education is indicated²⁰. Here, an antidepressant tablet would not bring about the desired outcome and potentially cause unwanted side effects alongside financial and environmental costs. In this sense waste is defined as using up resource while failing to meet the needs of the patient.

High value interventions have little waste, whereas low or negative value interventions are in fact, waste. Between these two points, however, there are many interventions used by doctors on a daily basis that have some value at some cost. The NHS has a finite amount of resource. If this is spent on costly interventions that have little benefit, then the service we provide will be of little value and the resources we have will be wasted. The key here is to focus on minimising waste¹⁸. By doing this, value is maximised.

An academic overview of the different types of waste

An academic view of waste has tended to distinguish between two types of inefficiencies. Productive inefficiencies create waste by using excess resources to deliver an intervention. Allocative inefficiencies deliver the sub-optimal intervention or test²¹. Waste in production is the difference between the current cost of the intervention compared with the least possible cost of the intervention if it was delivered efficiently. The 'reducing prescribing costs' case study below, is an example of reducing productive waste by reducing medication costs so we can provide medication for patients more efficiently.

Reducing productive waste Case Study 8: Reducing prescribing costs

Opportunity:

NICE states that 'when the decision has been made to prescribe a statin, therapy should usually be initiated with a drug of low cost'. Use of low cost statins varies from 28% to 86% across the UK.

Intervention:

Rochdale PCT rapidly improved its statin prescribing by using the UK's 'Better Care, Better Value' indicator. They implemented a process called the 'Prescribing Incentive Scheme', employed pharmacy technicians to work in GP practices, sent letters to patients explaining the statin switching policy, and engaged with secondary care, around the issue of statin initiation.

Patient benefits:

Quality of care maintained, costs reduced to service

Clinical resources saved:

Medication costs

Potential savings:

Prescribing low cost statins increased from 19% to 45% in Heywood, Middleton and Rochdale PCT within one year. If all PCTs achieved the same standard as the top performing area in the UK (achieving 86% low cost statin prescription), the NHS could save £85 million per year^{22,23}.

Reducing allocative waste

Case Study 9: Reducing inappropriate laboratory investigations

Opportunity:

Unnecessary use of laboratory tests is increasing. National benchmarking data highlighted a 31% increase in C-reactive protein (CRP) requests in a one-year period for a single region.

Intervention:

The University Hospital of North Staffordshire laboratory implemented agreed disease-related protocols and consultant only requesting. Implementation of demand-management strategies resulted in an overall reduction of 85% in the numbers of requests. An IT-based logic rule was also developed to reduce CRP requests made within a 24-hour time window of an initial request.

Patient benefits:

Reduced unnecessary blood tests

Clinical resources saved:

Blood tests
Medical equipment
Staff time

Potential savings:

The Trust saved approximately £10,000 per year from this simple intervention²⁴.

Reducing waste; the 'Lean' approach

Lean theory is one of the most widely used approaches to reduce waste in health care. The car manufacturer Toyota first developed the concept over 50 years ago with the aim of reducing costs and improving the rate of production. The Lean framework or theory has subsequently been implemented across many industries including health care. Its adoption across the NHS has become widespread over the past decade²⁵. Lean is essentially about getting the right things to the right place, at the right time, in the right quantities, while minimising waste. Lean theory brings a set of tools and methods that effectively reduce waste by improving the 'flow' of work in health care. These tools focus on analysing care pathways, delivery systems and organisational processes across all health care settings.

According to the Lean theory, there are seven different activities in health care that can lead to waste (adapted from the NHS Institute for Innovation and Improvement).

<http://www.institute.nhs.uk/>

- 1. Overproduction**

For example, automatically requesting blood tests for pre-op assessments or duplicating patient information across different services or teams.

- 2. Inventory**

For example, inappropriately using inpatient beds for patients who are waiting for tests but could be discharged safely, or ordering excess medical equipment because the supply is unreliable.

- 3. Waiting**

For example, surgeons waiting for a theatre to become available.

- 4. Transportation**

For example, moving a patient to an inpatient bed for review at post-op ward round and then to another ward for discharge.

- 5. Defects or errors**

For example, an inaccurate patient history or the incorrect recording of a blood test.

- 6. Staff movement**

For example, separate sites for outpatient clinics or large distances between clinically related areas.

- 7. Unnecessary processing**

Using complex equipment or processes to undertake simple tasks. For example, a referral to a specialist service that involves having to be reviewed by several different people before acceptance.

Section 3

Waste: a clinical perspective

Doctors as leaders in maintaining quality of care

There are currently two over-arching challenges facing the NHS; a scarcity of resource and growing concerns about quality of care. The Francis report led to a nationwide call for caring and compassion to be at the core of NHS culture. Doctors are well placed to provide a response to these two crises. They can ensure that as wasted resource is removed from clinical practice, compassion remains a central feature and quality of care is not affected.

In 2008, Lord Darzi's Report challenged NHS organisations to give doctors more control²⁶. Subsequently in 2010, the Government's White Paper 'Equity and Excellence: Liberating the NHS' gave doctors the lead role in commissioning services. The Francis, Keogh and Berwick reports all cite the need for improved leadership behaviours, values and competencies. Doctors are being called to step forward and take more of a leadership role in health care and need to work collaboratively with managers and clinical leaders to achieve doctor-led service improvement or reconfiguration of the way services are delivered.

The responsibility for waste reduction in the NHS is not restricted to doctors. All health care professionals need to be advocates of waste reduction. Pharmacists have responsibility for reviewing stock levels of medication and reviewing supply chain issues while nurses should review the way they conduct bedside care on the wards including; wound dressing, catheterisation and bed linen changing procedures. The wider public have a role in reducing waste too. Doctors need to work in collaboration with patients to ensure that the limited funds for health care are used optimally for maintaining population health rather than on treating conditions that could have been prevented. By any measure the NHS would benefit from encouraging a greater sense of shared ownership between commissioners, providers and the service users who all help fund the health care system. This will require a cultural shift from all aspects of society in order to maintain the fundamental NHS principle of free health care for all at the point of delivery.

A doctor's focus on waste

Doctors need to adopt an approach to clinical waste that does not shift their focus away from their clinical work. A clinical and patient centred approach is needed that allows doctors to appraise their daily practice for potential sources of waste. This clinical perspective on waste has three levels of focus:

Clinical Resources

Clinical resources are the principle ingredients of any care plan initiated by doctors and can be used in both clinical tasks and clinical processes. Clinical resources that doctors regularly use are detailed in Box 2

Box 2: Clinical Resources

1. Medications
2. Blood tests
3. Imaging tests
4. Medical and surgical equipment
5. Hospital beds
6. Operating theatres
7. Staff time
8. Fuel for travel
9. Energy for heating / lighting clinical spaces

Clinical Tasks

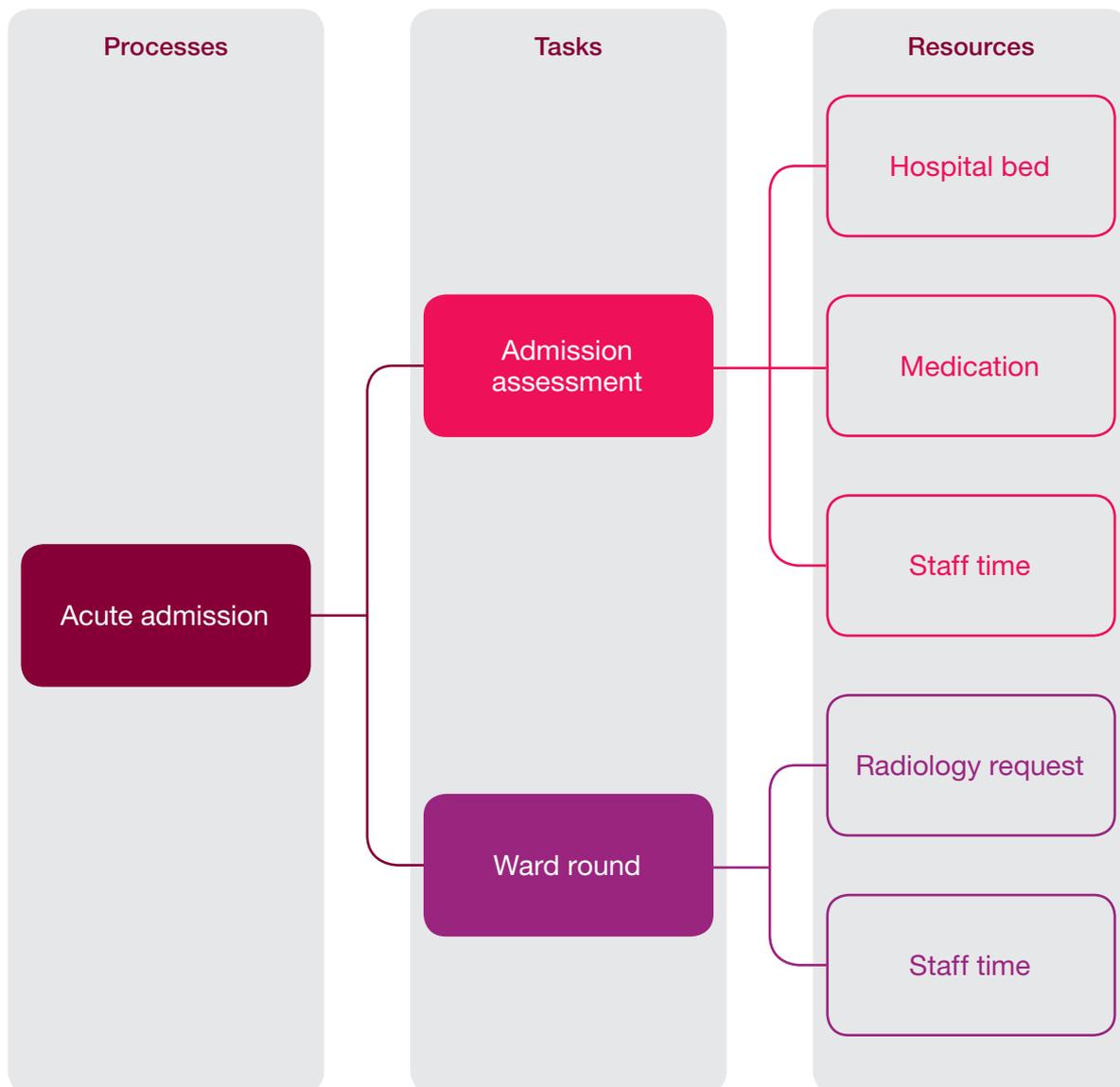
Clinical tasks are the activities that doctors deliver for service providers. They include consultations, home visits, medical assessments, operations and clinical meetings.

Clinical Processes

Clinical processes are how care pathways or patient journeys are constructed, they are how clinics are run or how referral pathways operate. Processes include all the steps involved in getting a patient to theatre and through to discharge afterwards. They comprise care pathways, clinics, patient journeys or referrals.

Figure 2 below demonstrates the relationship between these three levels of focus. Clinical resources are used in clinical tasks while clinical tasks are the constituent parts of clinic processes.

Figure 2. Clinical resources, tasks and processes



This report provides a process for reviewing waste in clinical practice, see Figure 3. This waste reduction toolkit provides a step-by-step guide for how to reduce waste.

Reducing waste in clinical resources is the simplest way to reduce waste and requires doctors to be critically aware of the resources they are using on a daily basis. Any clinical resource can add value to care. However, some use of resources have dubious value, no added value or even negative value, both to the patient and the health care system. Doctors must consider the value that is being added when using each resource²⁷. Before doctors request a blood test, prescribe a medication, or use a hospital bed, they must scrutinise their motivation for its use. See the case study below that examines the use of antipsychotic medication.

Reducing waste in clinical resources

Case Study 10: Evidence based prescribing

Opportunity:

In the treatment of psychosis the standard practice is to administer long-acting antipsychotics every 2 weeks. Guidance suggests that the longest possible interval should be used which can be up to 5 weeks (Flupentixol Decanoate). National prescribing patterns also suggest that excessive doses are being used. This can be up to 4 times the maximal effective dose.

Intervention:

Increase interval of antipsychotic administration to the maximum possible and reduce doses according to evidence base.

Patient benefits:

1. Reduced pain from more frequent injections
2. Reduced side-effect burden of over-medication
3. Reduced time spent in appointments

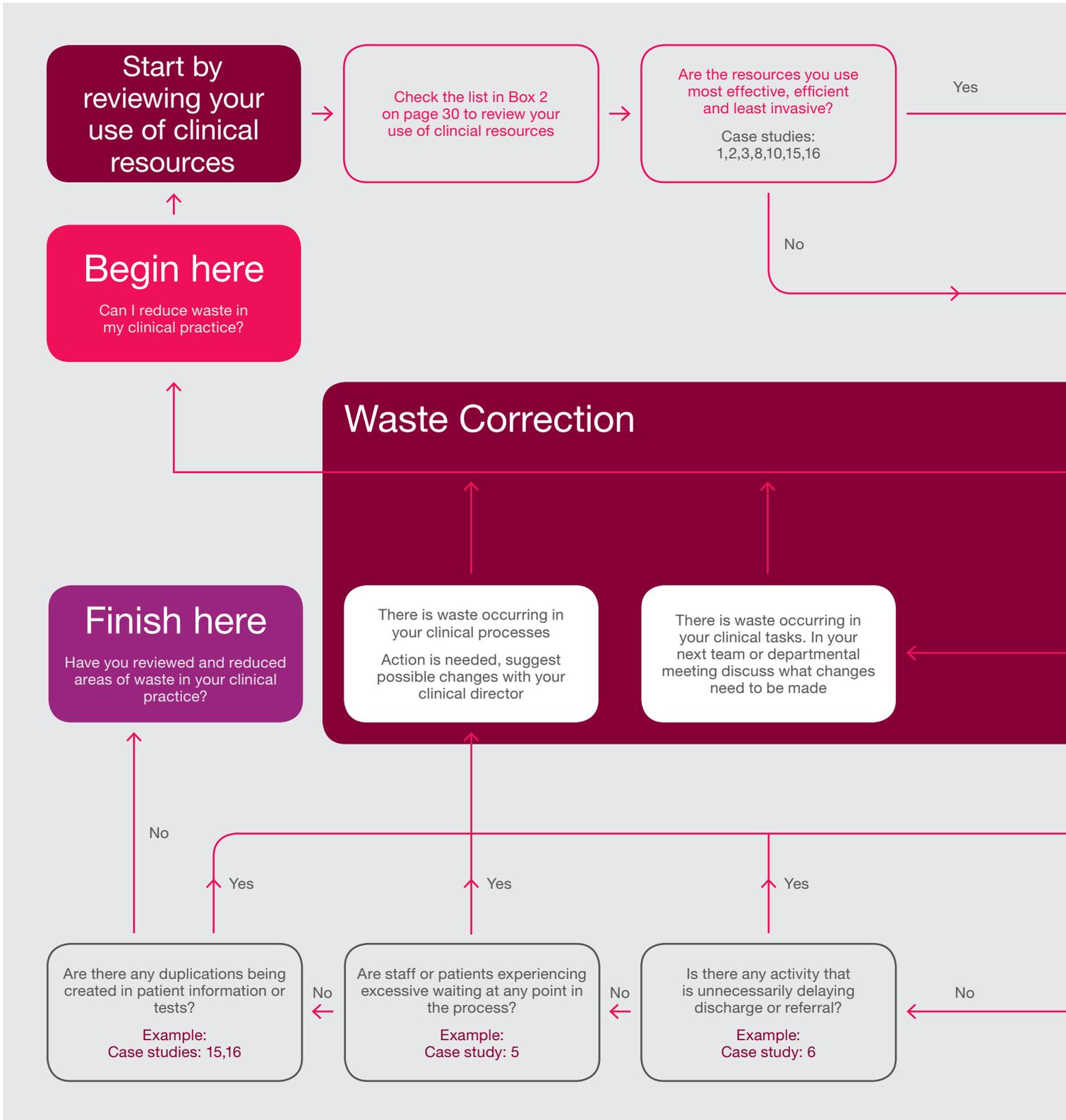
Clinical resources saved:

Medical equipment
Medication (reduced doses)
Fuel (reduced travel)
Staff time (reduced appointments)
Energy

Potential savings:

£486,000 per year across England
191 tonnes of carbon per year across England
Unpublished study; Maughan et al.

Figure 3 The Waste Reduction Toolkit



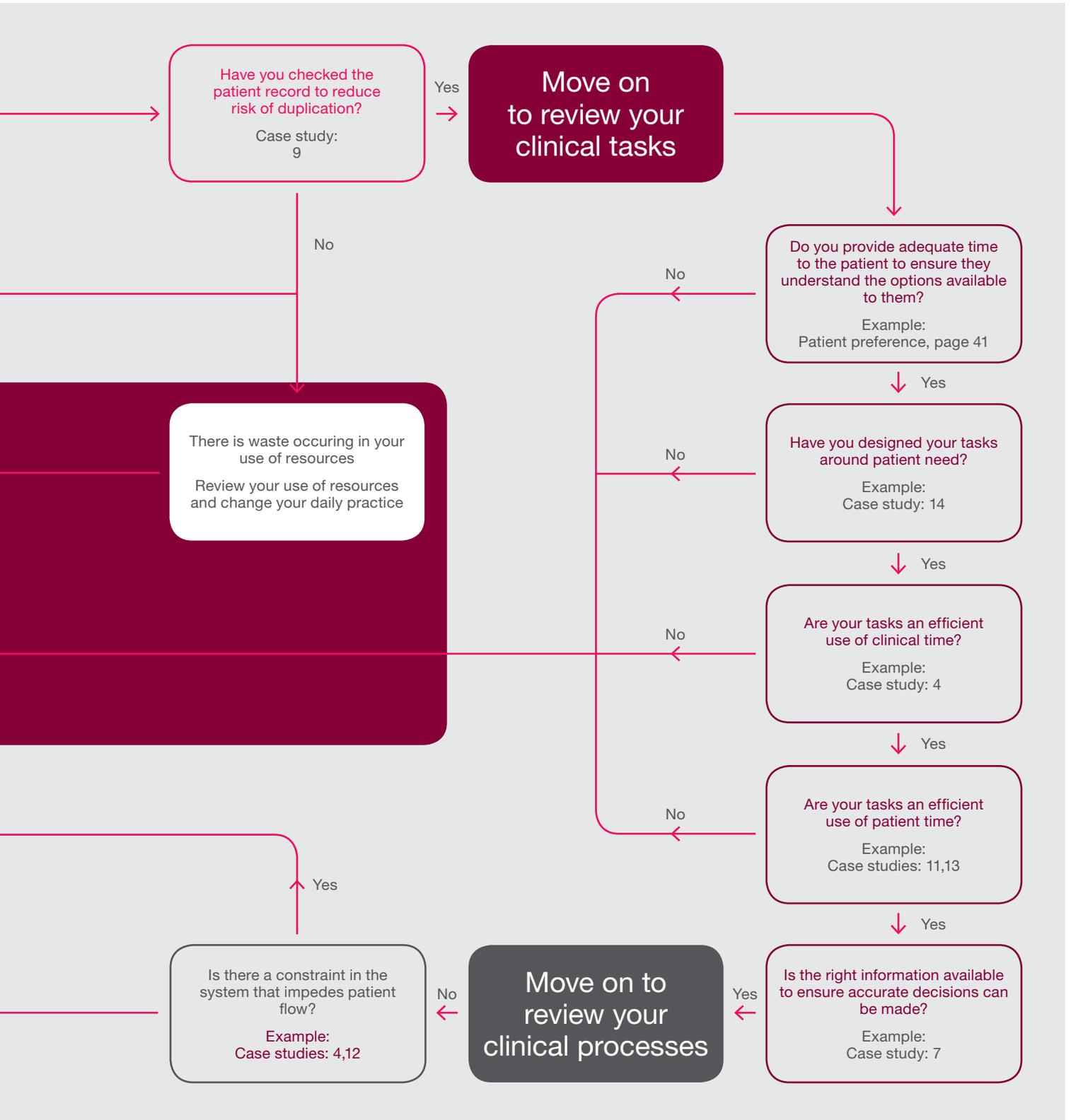


Table 3 Costs of prescriptions



Number of Prescriptions



Average number of prescriptions



Financial cost



Environmental cost

Per doctor per year	532 ¹	£4,500 ¹	1,940 kgCO ₂ e ²
Per head of population per year	18.7 ¹	£159 ¹	69 kgCO ₂ e ²
In NHS per minute in 2012	1,900 ¹	£16,000 ¹	7 tonnes CO ₂ e ²
In NHS per day in 2012	2.7 million ¹	£23 million ¹	9,900 tonnes CO ₂ e ²
In NHS per year in 2012	1 billion ¹	£8.5 billion ¹	3.66 million tonnes CO ₂ e ²

1 = data obtained from the office for national statistics ¹⁶ (The average net ingredient cost per prescription item is £8.52 in 2012)

2 = data obtained from the Sustainable Development Unit for Public health and NHS England ¹⁵

Figure 4 The waste hierarchy

When reviewing clinical resources use it is helpful to use the hierarchy of waste. The model in Figure 4 demonstrates how a change in practice can reduce waste in our day-to-day clinical activities.



Reducing waste in clinical tasks requires doctors to review their clinical duties and activities. In reviewing appointments, medical assessments or surgical operations, doctors need to question the value of what each activity provides for the patient. See the case study below that reviews community clinics as a type of clinical activity that has wasted resource in the form of staff time, energy use and hospital beds.

Reducing waste in clinical tasks

Case Study 11: Telehealth clinics

Opportunity:

NHS staff travel long distances when visiting patients in their homes as well as going to regular meetings in different parts of their organisation. This costs a significant amount of money in expenses and also wastes staff time due to travel and has associated carbon costs.

Intervention:

In NHS Derbyshire Community Health Services NHS Trust, staff collectively travel around five million miles a year. The Trust implemented a 24/7 audio conferencing service. During the first year, staff organised 1200 teleconference calls. This saved more than 3000 hours of staff travel time.

Patient benefits:

Reduced travel leading to less interruption to patients' daily lives, reduced stress and cost savings to patients.

Clinical resources saved:

- Staff time
- Fuel for travel
- Hospital beds

Potential savings:

20 tonnes of carbon, and £100,000 per year for the Trust²⁸.

Reducing waste in clinical processes requires larger, system-wide change. A coordinated response is required at a ward, departmental or hospital level to tackle this type of waste. This area of waste remains extensive and needs active engagement and leadership from doctors. Case study 12 demonstrates how reviewing the process of operating times can reduce waste.

Reducing waste in clinical processes

Case Study 12: Maximising capacity in the operating theatre

Opportunity:

Evidence suggests that operating theatres could be more efficient and safer for patients. A focus on managing waiting lists more effectively and improving patient flow could reduce wasted theatre time.

Intervention:

The Productive Operating Theatre (TPOT) is a programme developed by the NHS institute for Innovation and Improvement to improve efficiency and safety. University Hospitals Bristol used the TPOT to implement team job planning and a 6 week 'look ahead' system to reduce unused theatre time stemming from cancellations and unfilled lists. This led to improved theatre capacity and significantly reduced operative waiting lists.

Patient benefits:

- Reduced waiting time for surgery
- Reduced risk of cancellation

Clinical resources saved:

- Operating theatres
- Staff time

Potential savings:

£2 million (across the UH Bristol Trust)²⁹.

A patient's perspective

This report has outlined waste from a doctor's perspective, but waste can also be seen from a patient's perspective. They can undergo lots of unnecessary travel to see different doctors, for different conditions. A straightforward blood test will involve pain, anxiety and potentially the loss of half a working day. Patients may become frustrated if they find out that the blood test will have to be repeated because it got lost or because an inadequate sample was taken. See below a case study that demonstrates reducing waste from a patient's perspective.

Reducing patient related waste Case Study 13: Enhancing community-based treatments

Opportunity:

Admissions to hospital are often required purely for administering parenteral medication. In some circumstances this could be performed in the community.

Intervention:

The Sheffield outpatient antimicrobial (OPAT) service provides parenteral antibiotic therapy for patients in the community. It is run by a multidisciplinary team comprising infectious diseases physicians, a specialist nursing team, a pharmacist and a microbiologist. All patients on community antibiotic courses have a medical and nursing review at least weekly. This resulted in saving 334 admissions to hospital over the 2 year study period.

Patient benefits:

Reduced admissions
Care closer to home

Clinical resources saved:

Hospital beds

Potential savings:

Cost savings for the Trust was £1.5 million over 2 years³⁰.

If doctors do not attend to patient preference, this can lead to another source of waste. The King's Fund, in their recent report on patient preference, describe waste arising because insufficient attention is paid to what a patient actually wants³¹. As a result, doctors create management plans that are not in the patient's interests. An example of this is a patient who sees a surgeon about having a knee replacement. She wants the replacement done so she can carry on gardening. The surgeon examines her and books her in for surgery. She has the operation but afterwards finds out from the physiotherapist that she still cannot get down on her knees to garden. The answer to her problem was not surgery but building raised flowerbeds in her garden, but this preference was not elicited from her before the operation. Clinical decisions need to be made collaboratively, based on full information being given by both the doctor and the patient at the outset. When doctors accurately respond to patient preference the provision of unwanted services is eliminated.

To reduce this type of waste, doctors need to place patients at the centre of their care. Asking questions such as how the intervention might affect a patient's daily life, their future, their family, their job and their independence is key. Time spent goal setting with patients prior to intervening is likely to improve the value of the service. Organising services around patients, providing the right treatment at the right time and in the right place will reduce waste. The widespread introduction of personal health budgets this year aims to establish this patient focused delivery of care.

A good current example of patient focused management is palliative care. The brevity of the patient's life focuses doctors' attention on any waste that the patient might have to endure. Conversations about the value of each test and intervention are commonplace. Every effort is made to reduce patient travel, or time spent waiting for tests or procedures. As a result of this, palliative care, doctors often reduce the number of medications and tests that are performed. This is mainly due to the fact that active treatment for the terminal condition is stopped, but it is also because maintaining a focus on patient preference leads to tailored, personalised care. A patient centred approach therefore can lead to wider improvements for health care with unnecessary interventions being removed from care plans and unwanted admissions avoided. Baroness Finlay explains this point well:

“The cost effectiveness of palliative care cannot be measured just in relation to the patient. There are opportunity-cost savings from futile interventions. Such costs are avoided by freeing up hospital beds by early discharge, by avoiding unnecessary hospital admissions through good anticipatory care and by decreasing morbidity in the bereaved by good care around death. There is a shift from high-tech to person-focused care.”

Baroness Ilora Finlay
House of Lords Debate; Palliative Care Bill
Friday, 23 February 2007

Reducing patient related waste

Case Study 14: Intermittent chemotherapy

Opportunity:

When cure is impossible, cancer treatment should focus on both length and quality of life. Maximisation of time without toxic effects could be one effective strategy to achieve both of these goals.

Intervention:

Pre-planned treatment holidays in advanced colorectal cancer were assessed to see if any benefits were obtained for the patient. Patients received either continuous chemotherapy or intermittent chemotherapy.

Patient benefits:

Reduced admissions
Improved quality of life

Creating a different focus:

This study did show a small reduction in terms of overall survival for intermittent compared with continuous chemotherapy for advanced colorectal cancer. But chemotherapy-free intervals remain a treatment option for some patients with this type of cancer, offering reduced time on chemotherapy, reduced cumulative toxic effects, and improved quality of life³².

Waste in biomedical research and medical training

Many doctors are involved in research and medical training. Waste in research is complex and ubiquitous, but improved strategic direction and greater cooperation is required to tackle much of this waste. It has been estimated that about 85% of research investment is wasted, equating to \$200bn in 2010 globally³³. This is because of waste throughout the process of research from flaws in design and methodology to problems with the publication process. The Lancet has recently published a series of papers that outline the waste that occurs in biomedical research^{34,39}. This series calls for greater collaboration and transparency between organisations, with improved communication throughout the research process.

Waste can also lie within medical training. The recently published 'Shape of Training' Report recommended a broader base of knowledge for doctors with increased time spent in general training before specialisation⁴⁰. Sometimes waste can arise within the process of training when it does not accurately reflect current and future population health needs. With an ageing demographic a greater focus on generalist medical training is required rather than the current focus of highly specialised components early on in training. Recent emphasis has been placed on this type of waste in training and much improvement has been gained since the Modernising Medical Careers reforms in 2005.

Section 4

Focus on waste in diagnostics

Optimising Laboratory Test Requests

The demand for laboratory tests has expanded rapidly. It has been estimated that around 70% of all medical decisions are influenced by laboratory test results. Financial incentives, a fear of litigation and increased patient expectations have added to this pressure to increase test use. As tests have become easier to request, concerns about an increase in inappropriate use have arisen. Such unnecessary requesting, as well as wasting valuable resources directly, can lead to further downstream costs such as additional investigations and even hospital referral.

The recently published NHS Atlas of Variation in Diagnostic Services reports high levels of variation in the requesting of common diagnostic tests across all 151 Primary Care Trusts in England. This variation, (sometimes of over 1000-fold), cannot be explained by differences in population or disease prevalence⁴¹. It is also possible that the underuse of tests may also represent waste, for example, evidence suggests that under-use of HbA1C monitoring in Type 2 Diabetes can adversely affect longer term health outcomes⁴². Two doctor-led approaches have been initiated that aim to tackle this wasteful use of tests, the **'Demand Optimisation Group'** and the **'National Minimum Re-testing Interval Project'**.

In 2013, the Royal College of Pathologists set up a Demand Optimisation group that aims to ensure appropriate test requesting throughout the UK. This group aims not just to reduce unnecessary requesting but also to increase the appropriate use of tests where there are gaps.

The National Minimum Re-testing Interval Project⁴³ provides guidance that reflects the evidence base and expert consensus opinion. It aims to reduce the unnecessary repeat requesting of tests that is commonly seen in both primary and secondary care.

Reducing waste in diagnostics

Case Study 15: Local Application of a Minimum Re-testing Intervals Strategy

Opportunity:

The application of minimum re-testing intervals in laboratories could lead to reduced unnecessary testing.

Intervention:

Borders General Hospital (BGH) is a medium sized district general hospital situated in Melrose in the Scottish Borders. Over the past few years they have managed to facilitate the introduction of minimum re-testing intervals within their laboratory service.

1. C-Reactive Protein (CRP) testing has risen dramatically in recent years, with most patients moving to daily measurements as routine, even if levels remained undetected. A minimum re-testing interval of 3 days was introduced at BGH in consultation and agreement with both the clinicians and management. The subsequent reduction in test requesting was 30-40%. Exceptional requesting was still made possible and was overseen by the Consultant Chemical Pathologist.
2. Vitamin D. BGH refer testing for Vitamin D to Glasgow Royal Infirmary who as a result of significant increase in test use, implemented a minimum re-testing interval of 1 year. This again led to a significant reduction in the analysis of sample for vitamin D of around 50%.
3. Testing for HbA1c (for long term sugar levels) in patients with diabetes has been increasing significantly both as a result of diabetes becoming more prevalent and the pressure to use it as a diagnostic test for diabetes. BGH instituted a minimum re-testing interval of 3 months, and while no reduction in requesting has been observed, the rising trend has leveled off. These requests are vetted manually by laboratory staff.

Patient benefits:

Reduced pain from more frequent blood taking
Reduced time spent having unnecessary tests

Clinical resources saved:

Laboratory tests
Staff time (reduced appointments)
Energy

(The information above obtained by personal communication with Dr John O'Donnell, BGH)

Dilemmas in imaging: a narrative

Jane, a 40 year old executive assistant complained to her GP of increasing right hip pain and reducing mobility. An X-ray performed to 'exclude fracture' was reported to show no erosions or loss of joint space but a lucent line in the femoral shaft could represent either an artefact or an unusual stress fracture. Comparison with previous radiographs taken at the University Hospital would have been helpful but these were not available, so a CT scan was suggested.

Jane's 2-week wait for urgent out-patient hip CT meant that sleep was getting difficult as lying on her right side was now unbearable. The CT report stated that the femoral lucent line could still represent a longstanding stress fracture. A nuclear medicine bone scan was then suggested as Jane felt too claustrophobic to manage an MRI scan.

Two months after the original consultation with her GP, Jane returned to the surgery for results. The bone scan had managed to exclude a fracture, but as Jane's pain and disability were now far worse, the news was not comforting. Jane and her GP agreed that the time had come for specialist assessment.

The specialist seeing Jane suspected trochanteric bursitis and requested an urgent referral for an ultrasound. This confirmed the clinical diagnosis. Steroid injection therapy was performed at the same visit. Three months after the initial appointment and having had three unnecessary investigations, Jane has finally recovered, and is once again an active member at her local tennis club.

Waste arising from this narrative;

- **Slower diagnosis:** Accurate clinical information and discussion with a radiologist would have led to a quicker diagnosis
- **Increased harmful exposure:** Avoiding ionising radiological investigations is important
- **Staff and patient time:** A shared imaging record would have removed the need for further assessment following the initial X-ray
- **Unnecessary worries:** Avoidance of unnecessary procedures not only reduces costs but also the anxiety of incidental findings.

Reducing waste in radiology: a success story

Over-utilisation of imaging is a substantial problem. Imaging now accounts for typically 10% of health expenditure and estimates of inappropriate imaging outside the UK are about 40%⁴⁴. The UK, however, has one of the lowest per capita effective radiation doses in Europe⁴⁵. A national audit⁴⁶ performed in 2013 demonstrated a high degree of appropriate imaging (over 90%) from GPs' requests for CT and MRI scans. This is because of two initiatives that have been created by doctors:

1. The Royal College of Radiologists published referral guidelines in the nineties⁴⁷. This has provided a sustained reduction in imaging utilisation through greater awareness of appropriate imaging and reinforcement through educational messages on reports and at clinical meetings.
2. Improving access to and use of imaging referral guidance in patient pathways has yielded further reductions in unnecessary tests. Appropriate imaging (performing the best test first) is based on good medical practice. This has superseded the simplistic approach of simply reducing imaging numbers for the assessment of wasteful imaging⁴⁸.

Reducing waste in diagnostics Case Study 16: Reducing radiology referrals through educational reminders

Opportunity:

Some radiological investigations contribute little to clinical management, particularly lumbar spine and knee radiographs. Specific reminder prompts can reduce doctors' overuse of these investigations.

Intervention:

Guidance notes were provided alongside the report of every relevant radiograph. The number of referrals for both knee and lumbar spine radiographs reduced by 20% and remained consistently lower over a 1 year period.

Patient benefits:

1. Reduced exposure to radiation
2. Reduced appointments

Clinical resources saved:

Imaging tests
Staff time
Energy

Potential savings:

If applied nationally this project could achieve savings of £221 million (£24 per X-ray) per year¹⁷.

Challenges for doctors in reducing waste in diagnostics

Collaborative guidance

Produced by professional societies and other stakeholders is needed to ensure consistency and an evidence based approach to reducing wasteful practice.

Justifying requests

Balancing the benefit and risks of an investigation is essential not just for reducing wasted resource but to engender a patient centred culture.

Information sharing

Previous investigations and referral guidance should all be available electronically and easily accessed both within and between services.

Responding to incidental findings

Unexpected findings in blood tests and on CT, MRI and Ultrasound scans are inevitable and common. Performing unhelpful additional tests is wasteful of time and resource and can be reduced through providing accurate clinical information and following guidelines.

IT systems

These need to be fit for purpose and able to allow implementation of educational and restrictive/promoting mechanisms to aid diagnostic requests.

Section 5

The current health care context

Constraints

Demand for health care continues to increase and these constraints have resulted in a health care system that is stretched with limited resources. Constraints lie across economic, environmental and social domains. When this broad view is adopted the full impacts of health care are realised and the correct steps to reduce waste can then be taken.

Economic constraints

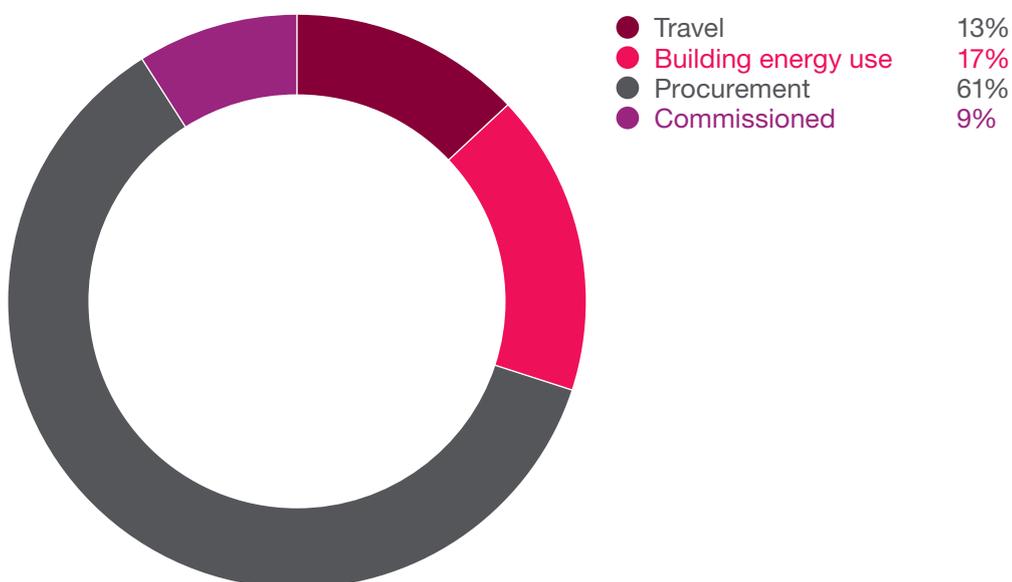
Treasury estimates suggest that the NHS has to find £20 billion of efficiency savings by 2015⁴⁹. The Department of Health has already saved £10.8bn of the £20bn in the years 2010-12 and states that it is on track to make £20bn of efficiency savings by 2015⁵⁰. But, a report produced by NHS England in 2013 said that despite these positive initial savings **'without bold and transformative change the NHS will become financially unsustainable, the safety and quality of patient care will decline.'**⁴.

Environmental constraints

Global climate change has been described as the largest threat to human health this century. In response to this threat, the Climate Change Act (2008) was introduced to ensure the UK cuts its carbon dioxide emissions by 80% by 2050 against a 1990 baseline. The NHS is subject to this Act and needs to contribute to meeting these targets. **The NHS is the largest public sector emitter of carbon and the majority of these emissions are associated with clinical factors such as pharmaceuticals and medical equipment**, see Figure 5 below⁵¹. In the future, as carbon constraints increase, balancing healthcare's carbon budget may become a greater challenge than balancing the finances. Understanding the carbon costs of healthcare activities will be increasingly important to meeting patients' expectations from a contracting resource base.

Scarcity of natural resources, such as precious metals, is another challenge that healthcare will have to face as medication and equipment often use precious resources in their manufacture. The Government has begun to think about this issue²², but focus needs to shift from supply chain interruption to the preservation of finite resources.

Figure 5. The principle constituents of the NHS carbon footprint in 2012⁴⁹



It is vital for doctors to be aware of the environmental waste that occurs in clinical practice. This includes the over-prescribing of medications, or over-use of investigations. **Doctors must advocate for reducing healthcare's carbon footprint, this issue has become a matter of probity for doctors in the UK.** In the medium term, transformative change to a far more preventative and patient-centred health system is required to meet this challenge.

Social constraints

Social changes that will cause increasing constraints to healthcare include an ageing population, a rise in long-term health conditions and increasing patient expectations. By contrast, other social changes could have the potential to reduce constraints such as technological, online and social networking developments and the empowerment of patients as active partners in their own care. Using tele-medicine to run virtual clinics or using technology to improve monitoring of patients with long-term conditions could both serve to reduce burden on health care⁵². **Remaining responsive to the changing needs and opportunities within society will ensure healthcare is sustainable, relevant and patient focused.**

Can integrated care models reduce waste?

The Government has suggested that money is being wasted because of a lack of integration between health and social care⁵³. As a result they have provided £300 million to specifically support the development of integrated care.

The point on a patient journey where social care breaks down and health care steps in is an obvious focal point. **Doctors should be central to these discussions about integrating care.** The Audit Commission suggests that not enough is being done to support people in the community in the early stages of illness, which can lead to unnecessary hospital admissions⁵⁴. Emergency admissions are too common and cost the NHS around £11 billion per year⁵⁵. There is a significant local variation between regions, with emergency admissions ranging from 1,555 to 3,709 per 10,000 of people aged 65 and over. This suggests that more could be done to reduce emergency hospital admissions.

Doctors can lead this integrated approach with social care and can reduce wasteful use of secondary care. The Academy suggests two areas of focus; personalised care for those with chronic and co-morbid conditions and greater clinical leadership around admission and discharge from hospital.

Personalised care can be achieved through:

- Creating multi-professional community-based teams to coordinate care for those with co-morbid and chronic health conditions
- Supporting the development of virtual wards in the community

Clinical leadership can be enhanced by:

- Creating community-based processes that enable early identification and intervention for patients with complex health and social care needs
- Supporting doctor-led, multi-disciplinary admission and discharge teams

Current initiatives that may help you reduce waste in health care

Clinical settings

An international initiative called **'Choosing Wisely'** has recently been started in response to the realisation that many interventions may be unnecessary or harmful⁵⁶. This involves requesting medical organisations, such as Medical Royal Colleges, to identify tests or procedures commonly used within their specialty, whose necessity should be questioned and discussed². This initiative aims to promote conversations between doctors and patients by helping patients choose care that is evidence based, not duplicative, free from harm and truly necessary.

The Department of Health launched the **QIPP** programme that was designed to support the NHS to improve care and lower costs⁵⁷. In the **QIPP** database, NICE has produced a large number of helpful case studies, many of these demonstrate doctors reducing waste in their clinical work. Concern has been raised as to whether this QIPP agenda by itself will be able to address the constraints on resources⁵⁸. The underlying assumption of this approach is that improved efficiency will lead to improved quality of care. Healthcare professionals across the NHS need to address waste in their individual clinical settings if the QIPP agenda is to fully achieve its aims.

The Department of Health has also launched two other important programs **'Digital First'** and **'the NHS atlas of variation'**. **'Digital First'** is an initiative that aims to reduce unnecessary face-to-face contact between patients and healthcare professionals by using technology. For example, instead of attending a hospital or GP appointment to receive a test result that indicates there is no cause for concern, it could be discussed on the phone, via email or SKYPE. **'Digital First'** is about using technology in healthcare where it can deliver the same high standards in a way that is more flexible and convenient for patients, and at a lower cost. The NHS atlas of variation documents variation between regions for various procedures and tests. One test or intervention may be much more frequently performed in one area compared with another. Knowledge about how often a service is using a test compared with another service can be helpful for determining where potential waste might be present.

The database of **'do not do's'** is an initiative started by NICE which identifies clinical practices that should be either discontinued completely or not used routinely³. It is an excellent resource for doctors who want to question the value of particular clinical practices.

The Sustainable Development Unit (SDU) launched a sustainable development strategy for the NHS aimed at reducing the environmental costs of health care⁵⁹. The strategy calls for greater focus on reducing carbon emissions, minimising waste and pollution, building resilience to climate change and nurturing community strengths. The SDU has also produced a report looking at reducing wasted medications⁶⁰.

Many CCGs including Hereford, North Durham and Kingston CCGs have started a waste medicines campaign. Hereford CCG claims it could save £1 million each year by using medications more wisely. This initiative asks patients to only request the medications they need and encourages them to seek pharmacy advice. North Lincolnshire CCG strategic aims state that they will tackle waste and duplication across all areas of health care. Southampton CCGs clinical strategy states they will reduce wasteful processes in healthcare delivery.

In Wales, the concept of Prudent Healthcare has gained significant momentum over the last 12 months. Prudent Healthcare is based on the following principles:

- Do no harm
- Carry out the minimum appropriate intervention
- Organise the workforce around the “only do, what only you can do” principle
- Promote equity between professionals and patients
- Remodel the relationship between user and provider on the basis of co-production

This is changing the way that health services in Wales are provided, ensuring that the delivery of care fits the needs and circumstances of patients while actively avoiding wasteful practice. The “making prudent healthcare happen” website, developed by the 1000 Lives improvement service in Public Health Wales further explains how to utilise this approach⁶¹.

Non-clinical waste management within the NHS

The SDU has produced some valuable guidance in the area of waste management⁵¹. The major responsibility for trusts is to produce a sustainable development management plan (SDMP). These SDMPs should detail how a trust is making efforts to reduce waste in line with current legislation. Estates and facilities departments have set a high standard for waste reduction across the NHS. A report produced by the SDU in 2012 found a significant variation in the volume of landfill waste produced between trusts and a variation in reductions of waste. All regions were able to achieve more than 10% reduction in the volume of waste produced per year between 2008 and 2012, with the London area achieving a 27% reduction in waste production⁶². In addition to this, the volume of landfill waste not recycled has reduced by 18% between 2008 and 2012.

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Calculations

Financial savings, where not directly calculated in the original report of the case study were obtained from service data from the following report; Curtis, L. (2011). Unit costs of health & social care 2011. Pssru.Ac.Uk. Retrieved from <http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf>

Carbon savings, where not directly calculated in the original report of the case study were obtained from service data from the following report; SDU. (2013). Goods and services carbon hotspots. Retrieved from http://www.sdu.nhs.uk/documents/resources/Hotspot_full.pdf

In this report carbon is used as a shorthand to express carbon dioxide equivalent units. This is a unit of measurement that incorporates all the major greenhouse gases and represents atmosphere warming potential.

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