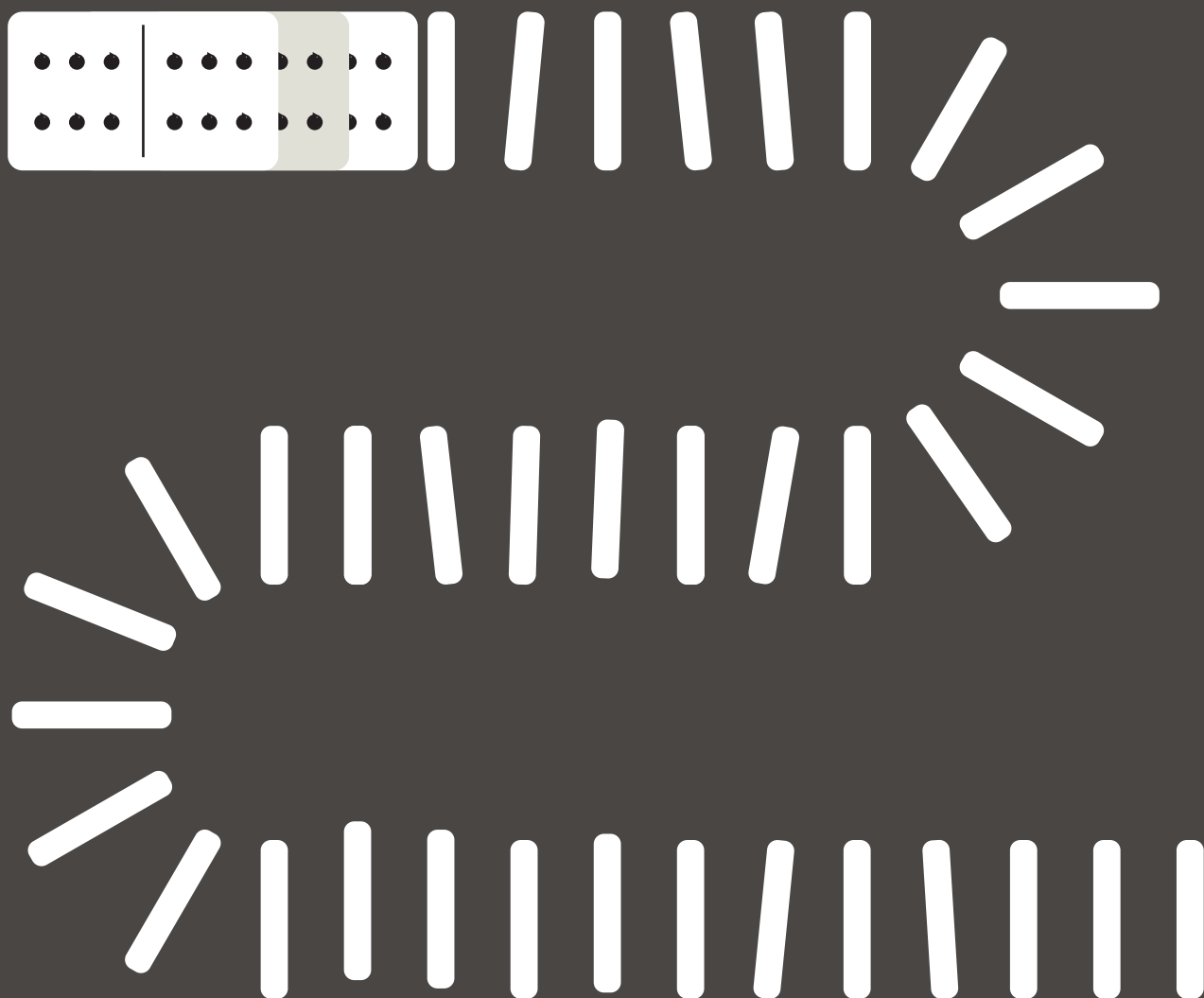


Behavioural insights in health care

Nudging to reduce inefficiency and waste

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Contents

Executive summary	2
Background	2
Key findings	2
Conclusion	4
1. Scope	6
Rationale and purpose	6
Method	7
Limitations	7
This report	8
2. Background	9
Behavioural economics, insights and nudges	9
Organising nudges	9
3. Evidence and application	13
Education and persuasion	13
Environmental restructuring	28
Incentivisation and coercion	36
Enablement	40
Evidence overview	45
4. Opportunities and considerations	47
Areas of inefficiency and waste in health care	47
Developing nudges	50
5. Conclusion	59
6. Appendix	61
Literature search methodology	61
Expert interviewees	62
References	63

Executive summary

Background

‘Behavioural insights’ has been described as the ‘application of behavioural science to policy and practice with a focus on (but not exclusively) “automatic” processes’.¹ Nudges are a particular type of behaviour change intervention that might be considered an expression of behavioural insights. Nudge-type interventions – approaches that steer people in certain directions while maintaining their freedom of choice² – recognise that many decisions – and ensuing behaviours – are automatic and not made consciously.³ Nudges have been proposed as an effective way to change behaviour and improve outcomes at lower cost than traditional tools^{4,5} across a range of policy areas. With health care spending rising and the NHS facing a significant funding gap, it is important to consider ways in which health care might be made more efficient and less wasteful. Given this backdrop, Ipsos MORI was commissioned by the Health Foundation to undertake a quick scoping review, supported and guided by expert interviews, to consider the evidence of and potential for the application of nudge-type interventions to health care for the purpose of improving efficiency and reducing waste.

Key findings

1. Nudge-type interventions with potential for changing behaviours, increasing efficiency and reducing waste in health care

- Evidence around **framing** of health messages is often inconsistent but it may be possible to predict message effectiveness according to specific characteristics of a target audience. Framing health messages using social comparison via *descriptive social norms* (pointing out what is commonly done) or using *injunctive norms* (pointing out what is approved of) has been demonstrated to have behaviour change potential. However, both types of norm may be vulnerable to forms of ‘*reactance*’ leading to unintended consequences. While there is some suggestion that descriptive norms may be more influential than injunctive norms when it comes to changing health behaviours there is a lack of definitive evidence.
- **Information design** both in terms of text and language (eg use of ‘plain English’ and behaviourally specific, concrete statements and presentation of risk) and appearance (eg colour, visual stimuli, images) may all influence how engaging or persuasive information is. There are numerous forms of health care information that might be better designed with implications for behaviour change, including clinical guidelines, discharge and handover templates, checklists, patient invitations and patient decision aids.

- **Prompts, cues and reminders** have been demonstrated to be generally effective in changing both health care provider and health care consumer behaviours, as well as being relatively inexpensive and easy to administer. However, there is still substantial uncertainty around how best to optimise and enhance such interventions. One promising development is the adoption of other nudge principles, such as framing and planning, to enhance reminder content. However, there is currently limited evidence available.
- **Default options** have been shown to have considerable influence on behaviours and are present across health care, in order sets, bundles and care protocols, technological prompts and communication strategies, as well as patterns of practice that are effectively ‘hidden’ defaults. The potential for application or redesign of defaults in health care is likely considerable but because they have significant behaviour change potential it is important they are designed, implemented and evaluated very carefully.
- Although not strictly a nudge, **financial micro-incentives** have been shown to be successful in influencing some ‘one-shot’ health care consumer behaviours, such as vaccination and screening, and as part of quality improvement initiatives to improve health care provider behaviours such as hand hygiene compliance. There is some suggestion that *loss-framed* financial micro-incentives (ie those paid upfront, introducing the prospect of financial loss if certain targets are not attained) may be effective but this may depend on both the audience and behaviour in question.
- Evidence of the use of **behavioural contracts and commitments** in health care appears relatively limited. The only systematic review evidence identified indicated that there is insufficient reliable evidence to recommend routine use of contracts in health care, but some trial evidence suggests contracts can have positive effects in some settings. While contracts and commitments are potentially powerful interventions, they may suffer from two principal problems: low take-up and variable effectiveness, both of which may be addressed by other nudge-type interventions. One promising enhancement to existing contracts and commitments is to use the principle of ‘public commitment’ as a form of social consequence.
- **Audit and feedback** interventions are generally effective, but there is still uncertainty around the specific components that make such interventions more or less effective. A set of tentative best practices derived from systematic review evidence suggests that various nudge-type interventions (notably information design, framing and specific forms of planning) may all offer ways to enhance audit and feedback.
- **Planning** interventions, including ‘planning prompts’ (prompts to make simple plans, eg in the form of a paper tear-off slip) as well as more specific types of ‘self-formulated conditional plans’ such as action plans and implementation intentions, may offer a simple, cheap and effective form of nudge-type intervention across a range of behaviours. While promising, planning interventions are not guaranteed to change behaviour, and existing motivation or intention to perform

a given behaviour is one of a number of factors that determine their effectiveness. Further, there is a lack of synthesised evidence summarising the effects of planning interventions with health care providers and consumers, although this gap is currently being addressed.

2. Areas of inefficiency and waste suitable for nudge-type interventions

Areas of inefficiency and waste to which nudge-type interventions might be productively applied include:

- improved rates of medication adherence, particularly for chronic conditions
- reduction of non-attendance at health appointments and limited take-up of health care programmes such as screening
- more effective shared decision making facilitated by better patient decision aids
- reduction of overtreatment
- improved discharge and handover processes
- reduction of hospital-acquired infections
- improved evidence implementation
- effective procurement and purchase of medical devices.

3. Opportunities and considerations for those developing nudge-type interventions

- This evidence review demonstrates that there are no ‘magic bullets’ when it comes to behaviour change and no one nudge-type intervention is guaranteed to work in changing health care-related behaviours. Developing effective behaviour change interventions likely benefits from theory-based behavioural analysis, an appreciation of context and structured selection of possible interventions with a particular consideration of acceptability and equity.
- Nudge-type interventions often comprise a number of different component parts. There is suggestive evidence that certain nudge-type interventions, eg audit and feedback and reminders, may offer ‘synergistic’ combinations. However, the question of what makes for effective combinations of nudge-type interventions remains largely unexplored.
- There remains a gap in the evidence around the long-term impact of nudge-type interventions. Absence of evidence is not evidence of absence, but maintenance of behaviour change via nudge-type interventions is an area that might benefit from greater attention.

Conclusion

There is much evidence that suggests the potential for all of these nudge-type interventions to be successful if suitably applied. However, the evidence available is highly variable in terms of quality, relevance to health care and behaviour change impact. Further, even for those interventions with the strongest evidence base – prompts, cues and reminders, and audit and feedback – there is much that is not yet known about how to enhance and optimise them. There is a clear need for more good quality evaluation and synthesised evidence of nudge-type interventions, their behaviour change potential and their impact on inefficiency and waste.

While nudge-type interventions hold much promise for reducing inefficiency and waste in health care it is important that intervention development clearly builds on existing research and theory. If this does not happen then nudging in health care is more likely to contribute to inefficiency and waste than reduce it.

1. Scope

In this section we outline the rationale for and purpose of this work, briefly touch on the methodology used and consider some limitations of this kind of review before finally outlining the content of the rest of the report.

Rationale and purpose

With health care spending rising⁶ and the NHS facing a funding gap of up to £30bn in the period to 2020, it is vital to make health care more sustainable by reducing inefficiency and waste, whether in terms of ‘supplies, equipment, space, capital, ideas, time, or opportunities’.⁷ Behaviour lies at the heart of this issue. Health care consumers’ behaviours are major determinants of their health, while health care providers’ behaviours are major determinants of whether the best and most appropriate care is delivered to health care consumers. However, the behaviours of both are often sub-optimal.⁸

It is argued that ‘nudges’ – approaches that steer people in certain directions while maintaining their freedom of choice² – offer an effective way to change behaviour and improve outcomes at lower cost than traditional policy tools.^{4,5} Indeed, the potential of ‘behavioural “nudge-type” policies in health care’ has been recognised in the 2014 *NHS Five Year Forward View* as a way to accelerate innovation and improvement in health care through changing individual behaviours.⁹

Nudges have been applied across a wide range of areas in the UK and globally, and there are a number of notable sources that document and collate some of this application in development policy,¹⁰ for policy design¹¹ and the policymaking community,¹² and even ‘health projects’.¹³ However, there is relatively little in the way of coverage of nudge-type behaviour change interventions to health care specifically and some uncertainty about how effective nudges are in bringing about desirable behaviour change.

The purpose of this evidence review is to begin to address this gap by:

- summarising the evidence of the application of nudge-type interventions in health care
- considering opportunities for reducing inefficiency and waste in health care using nudge-type interventions.

Method

This is a ‘quick scoping review’¹⁴ with some features of a more formal scoping review,¹⁵ supported by interviews with experts in the field of behaviour change and/or health care.* The review is guided by the following broad questions.

- What evidence is there of the successful application of nudge-type interventions in health care?
- What nudge-type interventions offer the greatest opportunities for desirable behaviour change in reducing inefficiency and waste in health care?

We searched Ovid MEDLINE®, retrieving documents from 1990 to February 2015. We used two sets of search terms – interventions and behaviours – with other relevant terms like ‘nudge’. We also included literature suggested in the expert interviews and adopted a light snowball approach, following up on relevant bibliographic references in sources already identified. Further detail is provided in the appendix of this report.

The focus of this review is primarily on behaviour change interventions and specifically those that are:

- ‘nudge-type’, ie non-regulatory and non-fiscal (although we do make an exception in the case of financial micro-incentives)
- simple (relatively easy to define with few components) rather than complex (comprising numerous components of which the ‘active ingredient’ is difficult to specify)¹⁶
- brief or very brief^{17,18} (likely to be feasible, scalable, acceptable, effective and low cost)
- individual level¹⁹ (either targeted at health care professionals or health care consumers)²⁰ as opposed to organisational level or population level²¹
- applied in and relevant to a health care context, specifically primary or secondary care.

In addition, only English language evidence was considered.

This review summarises the most relevant material from that process.

Limitations

The speed, breadth and focus (predominantly peer-reviewed journals) of the review mean that it is far from exhaustive. This area is notoriously challenging to search comprehensively,^{22,23} not least because it is likely that various nudge-type interventions have been adopted in everyday practice without either being evaluated or published or even recognised as nudges. In addition, we did not undertake detailed assessment of study quality, characteristics or results. As such, not all relevant or helpful individual studies will have been identified and included in the review. However, we hope that it provides a useful starting point and stimulus for thinking about this topic.

* Expert interviewee support and contribution is not the same thing as endorsement of the report.

This report

This report comprises the following sections:

- **Section 2: Background** – provides an overview of some of the terminology relevant to this area including ‘behavioural economics’, ‘behavioural insights’ and ‘nudge’ as well as situating the nudge-type interventions included in this review within a number of well-known behaviour change intervention frameworks.
- **Section 3: Evidence and application** – summarises relevant available evidence of different nudge-type interventions using case studies as illustrations of where and how these interventions have been applied to improve efficiency and reduce waste.
- **Section 4: Opportunities and considerations** – identifies a number of areas in health care that might benefit from the application of nudge-type interventions before reflecting on pertinent considerations and opportunities for those developing them.
- **Section 5: Conclusion** – offers a brief set of closing remarks.
- **Section 6: Appendix** – includes details of the literature search methodology and the expert interviewees.

2. Background

This section provides an overview of some of the key terminology in this area, as well as situating the nudge-type interventions included in this report in a number of well-known behaviour change intervention frameworks.

Behavioural economics, insights and nudges

‘Behavioural economics’, ‘behavioural insights’ and ‘nudges’ are terms often used interchangeably. The core insight of behavioural economics, a field that draws on economics and psychology, is that human behaviour is ‘determined by the very fallible brain and greatly influenced by the environment or context in which choices are made’.²⁴ Behavioural insights has been described as ‘the application of behavioural science to policy and practice with a focus on (but not exclusively) “automatic” processes’.¹

Both behavioural economics and behavioural insights draw on the idea that people have two systems for processing information and decision-making – the automatic and the reflective. The automatic (also known as System 1)²⁵ refers to a system that is typically fast, intuitive and unconscious, requiring little cognitive effort or time. The reflective (also known as System 2) is typically slower, conscious, rational, more effortful and more time-consuming. This ‘dual process’ model offers a ‘useful heuristic for characterizing the human mind’²⁶ and for providing a framework to understand error and bias in human decision making, and how this and resultant behaviour might be changed or improved.

Importantly, behavioural insights does not focus exclusively on System 1 and does not ignore the fact that behaviours are often best understood as a consequence of both systems. For example, important health care provider behaviours may be understood as expressions of Systems 1 and 2 operating in parallel, with some behaviours being more automatic (such as advising and examining) and some being more reflective (such as prescribing).²⁷ Traditional policy tools, it has been argued,²⁴ have focused too much on System 2, ignoring that much of human behaviour is automatic. Nudges may be thought of as a particular type of behaviour change intervention that operate mainly through the automatic system and have a particular focus on choice.^{3,28}

Organising nudges

In Thaler and Sunstein’s book of the same name, a ‘nudge’ is defined as:

Any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid.⁴

However, there is a real lack of clarity about what a nudge actually is. Gigerenzer suggests that this term has subsequently been used to describe almost anything that affects behaviour, rendering the concept ‘meaningless’²⁹ and as Marteau *et al* pointed out some time ago:

*... there is no precise, operational definition of nudging. This may reflect a reality – namely, that nudging is at best a fuzzy set intended to draw attention to the role of social and physical environments in shaping our behaviour and not to inform a scientific taxonomy of behaviour change interventions.*²⁸

This review does not seek to resolve this lack of consensus, but tries to be pragmatic in locating a range of nudge-type interventions within relevant and widely used frameworks. The table in Figure 1 of interventions proposed in the House of Lords Behaviour Change Report, based on the Nuffield Ladder of Interventions,³⁰ offers a starting point for thinking about what a nudge is. Here, a nudge is understood as one of four types of intervention – provision of information, changes to physical environment, changes to the default policy, and use of social norms and salience – that ‘guide and enable choice’ while being ‘non-regulatory and non-fiscal measures with relation to the individual’.

Figure 1: A ‘possible taxonomy’ of behaviour change interventions³⁰

Non-regulatory and non-fiscal measures with relation to the individual					
		Choice architecture ('nudges')			
Guide and enable choice					
Non-fiscal incentives and disincentives	Persuasion	Provision of information	Changes to physical environment	Changes to the default policy	Use of social norms and salience
Policies which reward or penalise certain behaviours eg time off work to volunteer	Persuading individuals using argument eg GPs persuading people to drink less, counselling services or marketing campaigns	Providing information in eg leaflets showing the carbon usage of household appliances <i>*Regulation to require businesses to use front of pack nutritional labelling, or restaurants to provide calorific information on menus</i>	Altering the environment eg traffic calming measures or designing buildings with fewer lifts <i>* Regulation to require businesses to remove confectionary from checkouts, or the restriction of advertising of unhealthy products</i>	Changing the default option eg requiring people to opt out of rather than opt in to organ donation or providing salad as the default side dish	Providing information about what others are doing eg information about an individual's energy usage compared to the rest of the street <i>*Regulation to require energy companies to provide information about average energy usage</i>

This table is useful, but only offers a ‘possible taxonomy’ of behaviour change interventions without being comprehensive. By contrast, the Behaviour Change Wheel (BCW) offers a ‘comprehensive and conceptually coherent’³¹ framework of behaviour change interventions – not all nudge-like – derived from a systematic analysis of 19 other behaviour intervention frameworks ‘explicitly in order to overcome their limitations’.³¹ The BCW proposes nine possible intervention functions – education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling, and enablement – that indicate the function of the intervention.³² One of the 19 frameworks on which the BCW builds is MINDSPACE,⁵ a well known report intended as a checklist for policymakers to think about the most important influences on behaviour.

Figure 2: The MINDSPACE mnemonic – a ‘checklist of influences on our behaviour’⁵

Messenger	We are heavily influenced by who communicates information
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Norms	We are strongly influenced by what others do
Defaults	We ‘go with the flow’ of pre-set options
Salience	Our attention is drawn to what is novel and seems relevant to us
Priming	Our acts are often influenced by subconscious cues
Affect	Our emotional associations can powerfully shape our actions
Commitments	We seek to be consistent with our public promises, and reciprocate acts
Ego	We act in ways that make us feel better about ourselves

MINDSPACE is not as comprehensive as the BCW and it ‘lacks coherence’³¹ in the sense that it combines policy strategies or types of intervention, such as defaults, with a mixture of other factors, including characteristics of recipients (ego) and related psychological constructs (affect). However, it has more of a focus on the automatic and includes important nudge-type interventions such as incentives, norms, defaults and commitments. As outlined in Figure 3, we use the BCW’s most nudge-relevant categories – retaining links with the version of the Nuffield Ladder outlined above and MINDSPACE – as the principal organising framework, though making certain adjustments to accommodate the findings of the search.

Figure 3: Locating nudge-type interventions identified in this review in the context of other widely used intervention frameworks

BCW	House of Lords	MINDSPACE	Coverage in section 3
Education and persuasion	Provision of Information; persuasion; use of social norms; use of salience	Messenger; norms; salience	We consider education and persuasion together, and two principal expressions of these broad intervention categories: framing and information design.
Environmental restructuring	Changes to physical environment; changes to the default policy	Defaults; salience	We focus on prompts, cues and reminders, and defaults.
Incentivisation and coercion	Non-fiscal incentives and disincentives	Incentives; commitments	We focus on financial micro-incentives and behavioural contracts and commitments.
Enablement	Although not recognised in either the House of Lords report or MINDSPACE, our search suggested two nudge-type interventions that could be understood as forms of enablement: audit and feedback and planning.		

Clearly this review employs a broad understanding of what a nudge is. Strict nudges are non-fiscal, which would rule out the inclusion of monetary micro-incentives, and mainly operate through the automatic system which might rule out interventions like commitments and planning.^{*} However, all the interventions included in this review have demonstrated promise in changing behaviour, broadly guide and enable choice and are easy and cheap to avoid. They might therefore be considered nudge-type interventions if not textbook nudges.

^{*} As one of our expert interviewees pointed out, we effectively expand the nudge principle to include two kinds of process: one in which the actor is unaware of an intervention (eg defaults) and one in which the actor must, at least initially, engage with an intervention (eg commitments and contracts). The latter process is less obviously nudge-like.

3. Evidence and application

In this section we summarise relevant evidence identified in our search. The focus is often on systematic review evidence given that such evidence is ‘more conservative and trustworthy’ than any one study, however well done.³³ We also include individual case studies that:

- illustrate application of nudges to health care,
- indicate the potential of certain nudge-type interventions,
- demonstrate inefficiency and waste reduction,
- or some combination of the three.

Education and persuasion

Education may be understood as ‘increasing knowledge or understanding’, for example by ‘providing information to promote healthy eating’.³¹ Educational interventions – low cost and feasible in most settings – for health care providers are usually intended to address knowledge and skills gaps. Interventions typically include ‘published or printed recommendations for clinical care, including clinical practice guidelines, audio-visual materials and electronic publications’, either delivered personally or via mass mailings.³⁴ Educational interventions are generally effective for improving appropriate care outcomes, drug choice and prescribing outcomes. However, they may have only a ‘small beneficial effect on professional practice outcomes’ when used alone or in comparison to no intervention.³⁵

Educational interventions directed at health care consumers are typically intended to help people know more about treatments. There is insufficient evidence to support educational interventions as being capable of improving adherence, knowledge or clinical outcomes when education is the sole intervention component, and what evidence there is suggests general ineffectiveness.³⁶ This evidence for educational interventions is broadly consistent with the suggestion that the provision of information to passive recipients has only ever been associated with limited behaviour change^{37,38} and ‘the potential for information-based interventions is fundamentally limited’.³⁹ However, when part of a multifaceted intervention – education in conjunction with other types of intervention – the majority of systematic review evidence suggests that there are benefits to professional care practice. Some review evidence also finds benefits to patient outcomes.^{36,40}

Case study: Eccles *et al* (2001)⁴¹

Effect of audit and feedback and reminder messages on primary care radiology referrals: a randomised trial

Radiological tests, often used by general practitioners (GPs), can be overused and contribute little to clinical management. Eccles *et al* compared two interventions aimed at reducing GP requests for radiological tests: an educational reminder message attached to radiographs and a six-monthly feedback of audit data. While the audit and feedback intervention was ineffective, the educational reminder message saw relative reductions of around 20% in requests for knee and lumbar spine radiographs. Although education or the simple provision of information on its own may have limited behaviour change potential, it may be used effectively in combination with other nudge-type interventions, in this case a reminder.

Another way in which educational interventions might be enhanced from a behaviour change perspective is to use principles of ‘persuasion’ in order to target motivation of the recipient.⁴² Unlike educational interventions, persuasive interventions use communication to ‘induce positive or negative feelings or stimulate action’.³¹ Our search suggested two principal varieties of persuasion: framing and information design.

Framing

Gains and losses

Messages used in health communication often use framing to try and persuade effectively. Framing imparts information about the consequences of a specific state of affairs, action or behaviour. There are broadly two types of framing:

- Attribute framing, which provides positive (framing as a gain) or negative (framing as a loss) versions of an equivalent message. For example, ‘the chance of survival with cancer is 2/3’ versus ‘the chance of mortality with cancer is 1/3’.
- Goal framing, which provides a description of the consequences of performing a specific action as a gain or a loss.⁴³

Systematic review evidence suggests that both attribute and goal framing have ‘little if any consistent effect on health consumers’ behaviours’.⁴³ However, there is suggestive evidence of differential framing effects under specific conditions. Gain-framed messages are thought to be more effective when a behaviour or procedure is preventative, such as physical activity and healthy eating, while loss-framed messages have been found to be most effective in encouraging behaviours aimed at early detection or prevention of a medical condition, such as self-examination to detect breast cancer.^{44,45} However, a recent meta-analysis⁴⁶ and a breast cancer screening study⁴⁷ suggested that the impact of gain- and loss-framed messages was not significantly different for detection behaviours.

Case study: Helder *et al* (2012)⁴⁸

Computer screensaver hand hygiene information curbs a negative trend in hand hygiene behaviour

Compliance with hand hygiene among health care providers is generally low despite it being a vital infection prevention measure. Helder *et al* used gain-framed messages emphasising the benefits of hand hygiene rather than the risks of non-compliance, delivered via screensavers on a neonatal intensive care unit to achieve significant improvements in hand hygiene compliance. Screensavers have also been demonstrated to be components of other effective interventions (eg those that support the implementation of evidence-based guidance on patient safety)⁴⁹ and may offer a useful mode of delivery for messaging as well as acting as a kind of prompt, cue or reminder.

Despite the inconsistency and inconclusiveness of evidence around health message framing, a recent review of the area found that it may be possible to predict the effectiveness of a gain- or loss-framed health message according to the characteristics of the target audience.⁵¹ Specifically, Wansink and Pope suggest that message effectiveness and impact is a function of subject knowledge and level of involvement in an issue, outcome certainty, risk tolerance and processing style.

Figure 4: Suggested 'individual (person-specific) characteristics that determine message effectiveness'⁵¹

Characteristic	Situations in which gain-framed messaging may be more effective	Situations in which loss-framed messaging may be more effective
Level of involvement in the issue	Low involvement: eg nutrition information for the general public	High involvement: eg breast cancer screening for high-risk individuals
Certainty of outcome	Outcome certain: eg belief that getting HIV vaccine through a trial would prevent contraction of HIV	Outcome uncertain: eg breast self-exams
Preference for risk	Risk-averse behaviour: eg using sunscreen	Risk-seeking behaviour: eg prostate exams
Need for cognition (processing style)	Heuristic processing: eg promoting exercise to the general public	Piecemeal processing: eg promoting healthy eating to registered dieticians

Wansink and Pope suggest that, in general, most people are less susceptible to ‘fear-based, loss-framed messaging’ and gain-framed messages are more likely to be successful in encouraging ‘adherence and compliance’.⁵¹ Familiar loss-framed messaging such as ‘smoking kills’ may not only have a negative effect, leaving target audiences with ‘a negative attitude and an unstable feeling’, but also have no impact on the target behaviour. Conversely, positive, gain-framed messaging targeted at a general audience with limited knowledge of a particular topic can create positive feeling about performing a behaviour, an incentive to perform the behaviour and the means to do so. For example, the message ‘If you quit smoking using this help line, you can save almost \$2,000 a year.’⁵¹

Despite this, the most comprehensive meta-analysis of fear appeals to date suggests that: they are generally effective at influencing attitudes, intentions and behaviours; there are very few circumstances under which they are not effective; and there is no evidence that they backfire and result in undesirable consequences.⁵⁰ Further, fear appeals are particularly effective when comprising recommendations for one-time only behaviours and when the intended audience is majority female. One point of consistency across the literature is that providing the means to perform a specific behaviour (eg getting a vaccine) may be a particularly important component of effective messaging. Another recent overview of fear appeals research⁵² suggests that this self-efficacy component of messaging is more important than the fear appeal.

Case study: Grant *et al* (2011)⁵³

It’s not all about me: motivating hand hygiene among health care professionals by focusing on patients

Two field experiments compared the impact on professional behaviour of signs about hand hygiene that emphasised personal safety (‘hand hygiene prevents you from catching diseases’) and patient safety (‘hand hygiene prevents patients from catching diseases’). Such messages may be understood as a variety of goal framing – providing a description of the consequences of performing a specific action. Results showed that the hand hygiene of professionals increased significantly when they were reminded of the implication for patients rather than themselves. Grant *et al* suggest the lack of impact of the personal safety message may be down to professional overconfidence about personal immunity. However, it could also be that the patient safety message was more effective because patient safety is the pre-eminent concern of the professional. Both interpretations would be consistent with the idea of framing as ‘tailoring messages to existing mental models’.¹⁰

A variant of goal framing* with evidence of successful application in a health care context is ‘anticipated regret’. Anticipated regret is defined as ‘to induce or raise awareness of expectations of future regret about performance of the unwanted behaviour’,⁵⁴ and is used

* We recognise that ‘anticipated regret’, as defined in the Behaviour Change Technique Taxonomy does not explicitly include ‘Information about emotional consequences’ but may be considered a form of framing if there is an additional suggestion for the adoption of a perspective or new perspective.

to bind people to a specific action by making more salient the possible negative emotional consequences of inaction. Anticipated regret has been shown to influence decision making and to predict intention to perform actions, as well as actual behaviours such as condom use,⁵⁵ exercise,⁵⁶ weight loss,⁵⁷ dental check-ups and self-examination.⁵⁸ Overall, the evidence suggests that people are more likely to perform an action when they anticipate regret for not doing so. However, it is important that anticipated regret interventions are subtle; if not, they may be interpreted as emotional appeals, decreasing the intervention's effectiveness.

Case study: O'Carroll *et al* (2015)⁵⁹

Anticipated regret to increase uptake of colorectal cancer screening (ARTICS): A randomised controlled trial

Colorectal (or bowel) cancer is the second most common cause of cancer death in the UK after lung cancer.⁶⁰ Screening is important for early detection and associated with reduced mortality, but levels of participation in screening rarely exceed 60%. Loss-framed messages that ask individuals to consider negative outcomes of not attending colorectal screening have been shown to be more effective than gain-framed messages in increasing intention to attend.⁶¹ Further, just asking people to think about and rate anticipated regret for non-attendance at cervical cancer screening has been shown to substantially increase attendance.⁶² O'Carroll *et al* used a questionnaire-based anticipated regret intervention alongside existing pre-notification letters to encourage adults to complete and return by post a faecal occult blood test (FOBT) for testing. Although no overall effect of the intervention was found, it did strengthen intention and increase uptake in those with low intentions. The authors concluded that exposure to anticipated regret may be required to increase FOBT uptake. In related work, O'Carroll *et al* are looking at the application of anticipated regret interventions to increase organ donation; a particularly pressing issue given that demand substantially outstrips supply.⁵⁹

Social comparison and norms

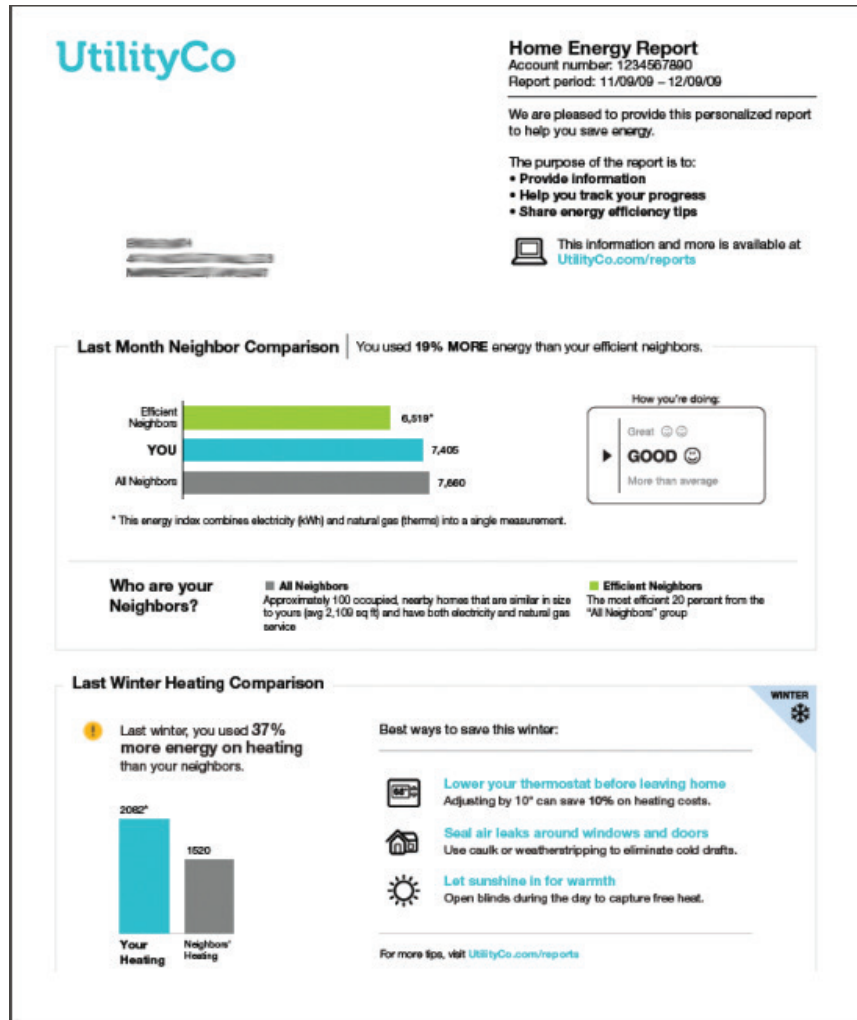
Social comparison – drawing attention to the performance of others in order to allow comparison with one's own performance⁶³ – has been demonstrated to be an effective way to change behaviour in many different areas. Social comparison draws principally on the idea of descriptive social norms, but as Cialdini *et al.*⁶⁴ point out it is important to be aware of more than just descriptive norms when it comes to influencing behaviour. Where descriptive social norms refer to what is commonly done (60% of people do X) injunctive social norms refer to what is commonly approved of (60% of people believe X is important).

A well-known application of this type of persuasive messaging is Opower's Home Energy Report. Among a number of different components* the reports indicate how consumers compare to the average and their most energy-efficient peers (a descriptive norm), as well as providing an assessment of overall performance (an injunctive norm) in the 'How you're

* In addition to social comparison, the reports use personalised feedback and energy conservation information and could be considered a form of enhanced audit and feedback.

doing' section.⁶⁵ Opower's social comparison programme has been remarkably successful, with the average programme reducing energy consumption by 2%.⁶⁶ These effects persist even after such reports are discontinued.⁶⁷

Figure 5: Opower's Home Energy Report⁶⁸



However, norms-based messages are far from guaranteed to be the most effective message type. For example, in a trial of different messages (including two norms-based messages) to prompt joining the NHS organ donor register, the two most successful messages of those evaluated were a 'loss-frame' message and a 'reciprocity' message. The 'reciprocity' message ('If you needed an organ transplant would you have one?') was the most successful and might also be understood as prompting anticipated regret.

One variety of injunctive norm that has been shown to be effective in influencing health care-related behaviour is professional recommendation or endorsement.⁶⁹ Such indications of approval are an example of 'source credibility' (or 'messenger' in MINDSPACE terminology): the idea that the weight we give to information may be strongly affected by the credibility of the source or sender. In the case of health care providers it has been shown that 'delivery comes from a trusted source' is an important active ingredient of audit and feedback interventions. Trust in clinical guidelines is likely to be much higher when the source is a professional association, in comparison to insurance companies, even with

identical recommendations.⁷⁰ For health care consumers, trust in the source of information is an important determinant of vaccination uptake.⁷¹ Physician recommendations – especially strong recommendations⁷² – increase vaccination uptake⁷³ while a lack of physician recommendation is one of the most common reasons for non-vaccination.⁷⁴ In addition, there is evidence that a GP’s signature on a screening invitation letter has a positive effect on uptake.⁷⁵

Case study: Hewitson *et al* (2011)⁷⁶

Primary care endorsement letter and a patient leaflet to improve participation in colorectal cancer screening: results of a factorial randomised trial

Hewitson *et al* looked at whether a general practitioner’s (GP) letter encouraging participation and a more explicit leaflet explaining how to complete a faecal occult blood test (FOBT) included with the England Bowel Cancer Screening Programme invitation materials would improve uptake. Participants were randomised to receive either a GP’s endorsement letter and/or an enhanced information leaflet with their FOBT kit. The GP’s endorsement letter and the enhanced procedural leaflet increased participation. The inclusion of both an endorsement letter and a more explicit procedural leaflet was estimated to increase participation in the English Bowel Cancer Screening Programme by ~10%, a relative improvement of 20% on existing performance.

Although our search found no clear evidence, there is some suggestion that descriptive norms may be more influential than injunctive norms when it comes to health behaviours.⁷⁷ This may be because less is known about injunctive norms⁷⁸ or because injunctive norms are particularly vulnerable to so-called reactance, where people may resist a suggested course of action if it is perceived to conflict with personal goals or autonomy.⁷⁷ Having said that, injunctive norms may help to protect against some forms of reactance – ‘boomerang’ effects – when using descriptive norms.⁷⁹ For example, descriptive norms may encourage certain undesirable behaviours if those who otherwise wouldn’t engage in the behaviour seek to match the social norm around that behaviour. Using injunctive norms that indicate approval of existing behaviours despite the descriptive norm may help reduce this reactance. In addition, an instructive study of food labelling recently found that the impact of injunctive norms may depend on how the norm is presented.⁷⁹ While red and green labels had no effect on perception and choice, emoticon – particularly frowning as opposed to smiling – labels were more effective for certain foods. Approval or disapproval of a given behaviour may in some instances be a matter of information design and more effective communication using pictorial presentation.

The way descriptive norms are presented may also influence their behavioural impact. For example, some evidence suggests that people are influenced less by their perception of how they differ from the average than their rank relative to others.⁸⁰ So-called ‘rank framing’ – telling people how they rank against others rather than how they compare to the average – may offer a potential enhancement to descriptive norms framing and social comparison.

However, using social comparison as a means to change behaviour may also create another form of ‘reactance’. If people feel poorly equipped to reach a certain level of performance then they may be demotivated and experience ‘discouragement from upward social comparison’,⁸¹ although this is not an effect that we found evidence of in health care.

Case study: Hallsworth *et al* (forthcoming)⁸²

Provision of social norm feedback to high prescribers of antibiotics in general practice: a pragmatic national randomised controlled trial

The Behavioural Insights Team, Public Health England, the Department of Health and the Chief Medical Officer recently ran a nationwide letter-based trial to discourage unnecessary prescription of antibiotics. A letter was sent to 3,300 GPs in 791 practices with the highest prescribing rates in their local areas. GP practices in the treatment group received a letter from the Chief Medical Officer stating that the practice was prescribing antibiotics at a rate higher than 80% of practices in its NHS Local Area Team. The study is currently under review for publication but initial findings suggest that practices that received letters saw a decline in antibiotic prescribing compared to those that did not.⁸³

In an instructive review of the social norms literature Tankard and Paluck suggest five conditions under which norms-based interventions are more likely to be effective and propose five questions⁸⁴ to guide norms-based interventions developers.⁸⁵ Although the list is not intended to be comprehensive, and not all conditions need to be satisfied for more effective interventions, it might be understood to provide a set of tentative best practices not dissimilar to those proposed for enhancing audit and feedback interventions (see page 40).

Figure 6: Tankard and Paluck’s norms-based intervention guidance

Conditions under which norms and behaviours are most likely to shift	Guiding questions for norms-based intervention developers
When individuals identify with the source of normative information	Who should the peer information be about?
When new norms are believable representations of group opinions and behaviour	How believable is the peer information?
When the individual’s personal views are closer to the new normative information	Do personal opinions align with the peer information or run against it?
When the new normative information is widely shared	Do people know who else is hearing the information?
When descriptive norms are contextualised	Does the information make a problem seem normal?

Information design

For information to be effective in changing behaviour, it is important to direct attention to key messages and be as clear as possible about required actions or behaviours. The Behavioural Insights Team has identified several principles of information presentation for more effective communication: ensuring key messages are presented as early as possible; keeping language simple; being specific about recommended actions; providing a single point of contact for responses; removing all information not absolutely necessary for performing a desired behaviour; as well as the broader idea of breaking down complex goals into simpler, easier actions.¹²

Case study: Michie *et al* (2005)⁸⁶

Words matter: increasing the implementation of clinical guidelines

Health and applied psychologists have long known that the wording of behavioural instruction affects the likelihood that it will be followed and that using specific, concrete statements makes information both more understandable and more memorable.⁸⁷ Ensuring clinical guidelines use specific concrete statements with recommendations in precise behavioural terms – what, who, where, when and how – as well as shortening them and making the style of presentation more accessible, have all been proposed as ways to improve the usability and implementation of guidelines. Michie *et al* rewrote a section of the NICE public guidelines concerning psychological and pharmacological treatments in behaviourally specified – 'plain English' – language. Although there was no behavioural outcome evaluated as part of the study, the rewritten guidelines led to stronger intentions to implement the guidelines, more positive attitudes towards them and greater perceived behavioural control over using them.

Example of original NICE guideline text compared with behaviourally specific 'plain English' text⁸⁶

Original	'Plain English'
Also, if you want psychological help, you will need antipsychotic medicines at the same time. Remember, the decision about which medicine to take is best made by you and your doctors together.	You will need to take these medicines if you also want psychological help. You should decide which medicine is best for you with the help of your doctors.

Better designed, more usable guidelines may offer a simple, low-cost way to close the the well-documented gap between recommended and actual practice⁸⁸ which could, in turn, have significant implications for improving quality and increasing efficiency of care.

Enhancing the text to make it more behaviourally persuasive may be complemented by effective use of visual stimuli. Daniel Kahneman, the Nobel prize-winning behavioural scientist, has pointed out that individual behaviour is heavily influenced by what our attention is drawn to.²⁵ Use of highlighting or bolding and appropriate use of colour – bright red or blue is more likely to be believed than green, yellow or pale blue⁸⁹ – may all increase the persuasiveness of information in terms of stimulating action. These kinds of principles have most obviously been applied in the field of nutrition labelling. Some evidence indicates that green and red labels to denote healthy and less healthy foods respectively may change food consumption behaviour,⁹⁰ although this evidence is mixed.⁷⁹ In addition, there is evidence that reordering information and choice – for example, menu items ordered according to calorie content rather than simply displaying calorie content – may influence behaviour through redirecting attention.⁹¹

Case study: King *et al* (2014)⁹²

Redesigning the ‘choice architecture’ of hospital prescription charts: a mixed methods study incorporating in situ simulation testing

Hospital prescription charts contain information about patients’ medications. These charts are often incomplete, illegible or out of date, which can contribute to error, unnecessary cost and patient harm. King *et al* redesigned an inpatient prescription chart (Imperial Drug Chart Evaluation and Adoption Study, IDEAS) to assess whether changes in content and design could reduce prescribing errors estimated to affect 50% of admissions in hospitals using paper-based charts.

King *et al* simplified the charts and used techniques to draw attention to key areas. Clinicians were no longer able to add information freehand as boxes encouraged use of individual block capitals and dosage units had to be circled rather than written. In addition, the form made effective use of colour to draw attention to required behavioural responses.

Figure 7: The anti-infective section of the IDEAS chart requiring prescribers to confirm that antibiotics should continue to be given every three days

ANTI-INFECTIVE AGENTS

Prescriber to review every third day and initial in red outlined box

MEDICINE (Approved name)

Date

Day #

08

12

18

22

Pharmacist Initials

An evaluation of the chart via ‘in situ simulation testing’ revealed significant improvements in completion of various parts of the chart, including correct dose entry, printed name and contact number.

There are numerous other information formats which might be improved through redesign. Health care providers view medical images across a wide range of specialties and there is considerable potential for error as a result of inspection and interpretation.⁹³ Enhancing medical images may support decision making, reduce error and improve patient care. Redesigning practice guidelines – beyond just text – is another area of potential development. Some radiology guidelines^{94,95} have optimised the display of medical images but there are still significant evidence gaps. For example, there is no accepted colour calibration or standardisation method for colour images or displays.⁹⁶ Modifying checklists⁹⁷ through greater attention to ‘design issues’⁹⁸ and overcoming poor wording could help increase their uptake and implementation. Finally, discharge templates⁹⁹ have been identified as a promising strategy for reducing avoidable readmissions and costs, and might be improved through information redesign.

Case study: Messing (2015)¹⁰⁰

Improving handover from intensive care to ward medical teams with simple changes to paperwork

Medical handover is another important part of health care practice that may benefit from having well-designed forms or handover sheets to ‘facilitate timely, complete and accurate handover information’.¹⁰¹ Traditionally, handover between intensive care doctors and ward teams in one UK hospital had been evaluated by assessing discharge summaries and patient notes and following up discharged patients. This approach saw handover present in a minority of cases with no documentation of the process. To improve this process simple changes were made to the template for discharge paperwork: i) a new line was added to act as a prompt in order to document to whom and at what time verbal handover was made, and ii) a new space was created in the daily handover sheet for patients with outstanding handover to be completed. An evaluation two months after the introduction of these simple changes found that 100% of patients had an electronic discharge summary completed prior to discharge as well as 100% having a fully documented verbal handover. The study’s authors suggest that simple changes made at no cost can have a ‘massive effect’ on a vital health care process with ‘likely... transferable’ impacts on ‘all other areas of care where handover and discharges are important’.

Information design matters for health care consumers too. Effective patient information must provide a balanced discussion of benefit and harm using language and images. Patients need enough information to be able to make informed choices but not so much that they are overwhelmed.¹⁰² This is further complicated by the fact that communicating risk and statistics is an essential part of patient information, yet many health care consumers – and providers – are unable to understand statistics sufficiently well.¹⁰³ Helpfully, the Patient Information Forum has developed a best practice checklist for the communication of risk to support information producers and providers.

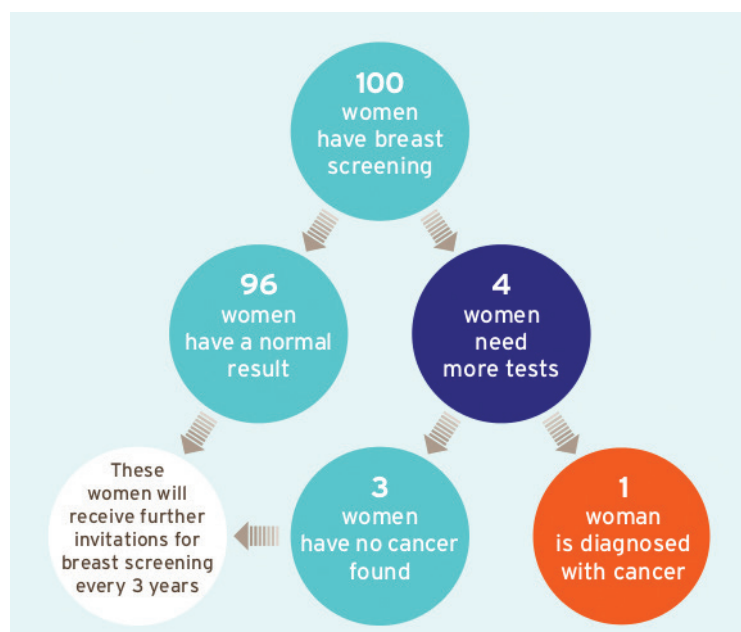
Figure 8: Patient Information Forum Toolkit: risk checklist¹⁰⁴

PiF Toolkit key step
Be cautious using verbal descriptors of risk. If used, ensure these are accompanied by statistical information.
Use absolute risk rather than relative risk.
Use natural numbers rather than percentages.
Consider using both positive and negative framing for risk.
Communicate uncertainty of data; explain the effect confidence intervals have on data.
Consider using a mix of numerical and pictorial formats to communicate risk.
Make risks relevant. Consider using examples as a comparator.

In addition to these core principles of risk communication there are many – though not necessarily widely used¹⁰⁵ – ways to make information more engaging, comprehensible and usable including visualisations,¹⁰⁶ infographics,¹⁰⁷ icon arrays¹⁰⁸ and option grids.¹⁰⁹

Case study: Forbes et al (2014) ¹¹⁰
Offering informed choice about breast screening
<p>The NHS breast screening leaflet¹¹¹ has been described as a 'revolution in presenting patients with balanced information so that they can make an informed choice.'¹¹² The leaflet provides detailed information on overdiagnosis, benefits, harms and uncertainties. The leaflet makes use of risk communication formats that most effectively convey the potential harms and benefits of interventions, such as expected frequency trees (see Figure 9). Provision of the leaflet is accompanied by a more obvious nudge: an invitation to screening from the NHS, which may be seen as a recommendation.</p> <p><i>continued...</i></p>

Figure 9: Using expected frequencies to communicate the chances of different events subsequent to a mammogram – from the NHS Breast Screening leaflet¹¹³



The use of visuals and images may make some information more persuasive. For example, presentation of visual images as part of personalised health risk assessment may support behaviour change,¹¹⁴ and images with a sufficient ‘level of threat’ may make information more believable and increase intention to engage in risk-reducing behaviours. However, there is still much that is not known about the use of visual images. A current Cochrane Review protocol seeks to ‘estimate the extent to which presentation of visual images of potential health risks or adverse consequences associated with health behaviours may increase or decrease health behaviour’, including adherence to advice or treatment and use of health services such as attendance for screening or treatment.¹¹⁵

Visuals and images may be a good way to provide an overall ‘gist’ of information but individuals vary in their ability to understand visual presentation. Further, there is some suggestion that using numbers may be a better way to communicate detail.¹¹⁶ As suggested by the Patient Information Forum Toolkit, a combination of formats may offer the best way to reach as many people as possible.

Patient decision aids – tools that facilitate informed, value-based decisions about treatment options – need to strike this balance effectively, especially given that various cognitive biases (often as a result of framing) may mean that patients do not always select the best treatment option.¹¹⁷ Some evidence suggests that patient decision aids may be enhanced through the application of nudge principles, whether using graphical information to unbiased order effects,¹¹⁷ or in promoting certain treatment options when there is a good case that one option is clearly superior to another.¹¹⁸

Case study: Bansback *et al* (2014)¹¹⁹

Development and preliminary user testing of the DCIDA (Dynamic computer interactive decision application) for 'nudging' patients towards high quality decisions

Bansback *et al* developed a computer application that contained the same content and information as a conventional patient decision aid but used nudge principles to structure it differently. The approach recognises that, when faced with decisions or information that is complex or overwhelming, individuals may switch to 'System 1 functioning', which is more likely to result in decision error. DCIDA sought to enable users to read less information but focus on information more relevant to their choice. Specifically, Bansback *et al* sought to overcome four common errors that can impede good quality decision making: unstable values, order effects, overweighting of rare events, and information overload.

As shown in Figure 10, the first unique feature of DCIDA is the value clarification task at the beginning of the decision aid – typically this appears towards the end. This first 'value clarification' step allows the results of the exercise to individualise future information. The second step, 'information about the options and scoring', orders information in terms of importance. The third step, 'summary...', displays information for all consequences like a conventional decision aid but makes a number of nudge-type enhancements: consequences are reordered in line with preferences from step 1; row size differs according to the importance of consequence with wider rows more important and more salient; colour is used with lighter shading indicating a preferred option; and the overall 'optimal' choice is presented as the opt-out default.

Although a very small study ($n = 20$), preliminary usability and usefulness testing suggested that DCIDA may support better quality decision making by allowing patients to focus more on features of the decision that were most important to them and, in some cases, to change their decision. Bansback *et al* suggest that DCIDA offers a promising nudge-based enhancement to conventional patient decision aids but much further development is required.

continued...

Figure 10: DCIDA version of the patient decision aid

Value clarification exercise:

Matters

Not A lot

Benefit

Side-effect A

Side-effect B

Side-effect C

Mode of admin

Information about the options and scoring: benefits and harms including pictographs for risk information

Side-effect A

When using option 1, about 2 in 100 (4%) fewer people like you (3 in 100 total) will experience side-effect A in the next 5 years compared to no treatment

How important is this to you?

Benefit etc

Summary information and preferred option:

Criteria	Option		
	1	2	3
Side-effect A	Low risk	Medium risk	High risk
Side-effect B	Low risk	Low risk	Medium risk
Benefit	Small improvement	Medium improvement	Large improvement
Mode of administration	None	Pill	Injection
Side-effect C	Low risk	Medium risk	Medium risk
Preferred option?	○	○	○

Environmental restructuring

Environmental restructuring refers to changes to a given physical or social context.³¹

Our search revealed evidence for the application of two principal types of environmental restructuring:

- prompts, cues and reminders
- defaults.

Prompts, cues and reminders

Prompts and cues ‘introduce or define environmental or social stimulus with the purpose of prompting or cueing a behaviour’¹²⁰ and may be delivered in a variety of ways, ie verbally, on paper, electronically and so on. Prompts and cues may be thought of as a type of reminder that normally occurs on or around the time or place of performance of the behaviour, such as an on-screen prompt for a health care provider to ask about a certain patient behaviour or a reminder to attend a scheduled appointment for a health care consumer.

Case study: Fogarty *et al* (2013)¹²¹

Hospital clinicians’ responsiveness to assay cost feedback: a prospective blinded controlled intervention study

The principle of providing cost feedback has long been known to have behaviour change potential. One 1982 study saw an average reduction of 31% in the cost of tests ordered per patient among those who received information about the price of tests compared to a control group.¹²² Fogarty *et al* used this principle – which might be thought of as a kind of framing – when evaluating the impact of introducing a brief message (a prompt) providing cost feedback on physician diagnostic test ordering. The introduction of a brief message into C-reactive protein (CRP) reports stating, ‘Cost per test £1.00; total NUH [Nottingham University Hospitals] spend on C-reactive protein [CRP] assays in 2010 was £200,914’ saw a sizeable decrease in demand for CRP blood assays. As the authors suggest, use of the principle of cost feedback has ‘significant implications for healthcare delivery’ but requires further evaluation using more robust controlled research design. The lead author is currently leading two further studies using a related concept in different settings.

Reminders have been shown to be generally effective in changing health care provider behaviour and improving processes of care across a range of settings¹²³ and specifically in improving appropriate care behaviour and prescribing-related behaviours, although there are mixed results for improving choice of drug.¹²⁴ Reminders for health care providers are more likely to be successful when they are either designed to meet the specific needs of the clinical setting they are serving or proactively prompt and/or require a response.¹²³

Computer generated reminders delivered on paper to health care providers achieve moderate improvement in process of care, especially when there is space on the reminder for a response from the clinician and an explanation of the reminder's content or advice is provided.¹²⁵ On-screen point of care computer reminders generally achieve small to modest improvements in behaviours such as medication ordering, vaccinations and test ordering.¹²⁶

Case study: Bourdeaux *et al* (2015)¹²⁷

Evaluation of an intervention to reduce tidal volumes in ventilated ICU patients

Good evidence suggests that low tidal volumes (ie the air displaced between inhalation and exhalation) for patients receiving mechanical ventilation reduces patient mortality. While physicians often state that they do use low tidal volumes, or that they intend to, they often fail to do so. To improve compliance with low tidal volume targets and overcome the intention–action gap, Bourdeaux *et al* introduced two large display screens visible to most staff working in the ICU to display a number of metrics derived from the clinical information system (CIS) database, including the delivered tidal volume in ml kg⁻¹ (PBW). If tidal volume breached predetermined targets then alerts, visible to ICU clinicians, were triggered in real time. Changing the format of the data (information design) and using real-time alerts (a form of prompt) increased the time patients spent at recommended lower tidal volume levels. The intervention was deemed acceptable by staff, was relatively easy and low cost to implement and clearly led to an increase in compliance with recommended standards to a greater extent than 'conventional audit processes'.

Systematic review evidence also suggests that reminders change some health care consumer behaviours. Telephone and SMS reminders are similarly effective in reducing missed hospital appointments – with the latter probably more cost-effective¹²⁸ – regardless of whether reminders are sent the day before or the week before an appointment.¹²⁹ Reminders have also been shown to significantly improve immunisation uptake. However, evidence of the impact of SMS reminders on medication adherence is mixed¹³⁰ and long-term effects remain unclear.¹³¹

Overall, while there is good evidence for reminders being effective, relatively inexpensive and easy to administer across many settings for both health care providers and consumers, there is still uncertainty around what modifies the effect of reminders, how to 'prioritise and optimise' them and their long-term effects.^{42,123}

Case study: Hallsworth *et al* (2015)¹³²

Stating appointment costs in SMS reminders reduces missed hospital appointments: findings from two randomised controlled trials

The idea of using SMS reminders to reduce missed appointments is not new. For example, Sims *et al* found that text message reminders could reduce the number of missed psychiatric appointments by 25–28% in mental health services, where non-attendance is two to three times the rate of other medical specialties.¹³³

Hallsworth *et al* took this generally effective intervention one stage further by looking at how reminder content impacts effectiveness in the context of hospital appointment attendance. Appointments were randomly allocated to one of the four reminder messages (see Figure 11).

Figure 11: Wording of reminder messages used.

Message	Wording
Control	Appt at [clinic] on [date] at [time]. To cancel or rearrange call the number on your appointment letter.
Easy call	Appt at [clinic] on [date] at [time]. To cancel or rearrange call 02077673200.
Social norms	We are expecting you at [clinic] on [date] at [time]. 9 out of 10 people attend. Call 02077673200 if you need to cancel or rearrange.
Specific costs	We are expecting you at [clinic] on [date] at [time]. Not attending costs NHS £160 approx. Call 02077673200 if you need to cancel or rearrange.

The most successful message from the first trial, ‘specific costs’ – using the principle of cost feedback in line with Fogarty *et al* – showed an absolute 2.7% reduction in missed appointments compared to ‘Control’. In a second trial, a ‘general costs’ message – ‘Not attending wastes NHS money’ – still reduced non-attendance but less so than the ‘specific costs’ message. The authors conclude that adopting the ‘specific costs’ message in place of the ‘control’ message would result in 5,800 fewer missed appointments per year in the NHS trust in question. In explicitly considering reminder content, Hallsworth *et al* may be the first to begin to address the question of how best to ‘prioritise and optimise’ reminders in health care.

Although prompts, cues and reminders have been shown to be a generally effective form of intervention, the type of behaviour to which they are applied likely matters a great deal in terms of how effective they are. Taking medication adherence as an example, non-adherence is a combination of unintentional non-adherence (probably arising from forgetfulness, misunderstanding and/or confusion) and intentional non-adherence (patients choosing to deviate from a treatment regimen).¹³⁴ Adherence behaviours are often a combination of both these elements, but if non-adherence is intentional it might help explain why, for example, SMS reminders have been found to have ‘very modest benefits’.¹³⁵ However, simple reminders incorporating the right kind of content might be more effective. For example, a systematic review focusing on anti-epileptics found that multiple reminders featuring action planning were more effective than patient education.¹³⁶ Recognising that non-adherence tends to get worse over time, another systematic review recommended testing a delayed reminder as opposed to the immediate reminders used in related previous trials.¹³⁷ This recommendation is currently being evaluated to support long-term use of cardiac medications in patients post ST-elevation myocardial infarction.¹³⁸

Priming – or the idea of placing ‘incidental cues in the environment to influence a non-conscious behavioural response’¹³⁹ – is another form of environmental restructuring with existing and potential application in health care. Environmental and situational cues of various sorts – notably screensavers, posters and so on – are often used in health care but these usually take the form of prompts, cues and reminders that elicit a conscious response, such as drug reminder packaging to influence adherence behaviours.¹⁴⁰

There is evidence that environmental and situational¹⁴¹ – including auditory¹⁴² – priming can influence behaviours but most of the available evidence appears to relate to food and drink consumption.¹⁴³ However, there is some evidence of the use of ‘multisensory’ cues – audible reminders¹⁴⁴ and ‘olfactory cues’ (using ‘fresh scent’ to subconsciously cue more hygienic behaviours)¹⁴⁵ – in improving hand hygiene. There is also suggestive evidence that ‘watching eyes’ – displaying images of eyes as a form of cue – may influence health care behaviours. This cue has been shown to cause individuals to behave more pro-socially in lab and field contexts such as charitable donation, tidying litter and bike theft¹⁴⁶ and a recent study found placing a picture of ‘male eyes’ over a hand gel dispenser improved hand hygiene behaviour.¹⁴⁷ While priming interventions show promise the evidence available is very limited and our search identified no systematic reviews.

Defaults

Defaults are probably the best known and, some suggest, the most effective type of nudge.¹⁴⁸ The best known type of default option are opt out policies in which individuals are assigned – defaulted – to a certain choice from which they must actively opt-out if they do not want to pursue the default option. Individuals are more likely to stay with a default option, especially in the absence of strong preferences and where choosing an alternative would demand significant effort. For example, organ donation¹⁴⁹ rates are four times higher in an opt-out system – where consent to donate is assumed and explicitly opting out is required to avoid donation – than an opt-in system. The same has been demonstrated in a variety of other areas including flu vaccination,¹⁵⁰ enrolment in savings programmes¹⁵¹ and charitable giving.¹⁵²

One prominent form of health care default is diagnosis-specific order sets – also known as bundles – and care protocols. Bundles are available for a range of clinical situations and provide a standard form of practice that health care providers may implement or not as needed. While there is evidence of the successful application of bundles, for example in the reduction of catheter-associated urinary tract infections,¹⁵³ overall evidence is mixed and suggests that ‘simply implementing protocols that change defaults may be insufficient to overcome practice patterns’. For example, despite the fact that the ‘Sepsis Six’ clinical care bundle has been demonstrated to halve the rate of death from infection, median implementation rates are low.¹⁵⁴

One effective form of default implementation is found in computerised order entry (CPOE) systems. CPOE systems using default order sets can ‘significantly influence physician selection of laboratory tests’¹⁵⁵ with their implementation in hospital-related settings associated with a ‘greater than 50% decline’ in preventable adverse drug events.¹⁵⁶ Further, making generic rather than brand-name drugs the default option on electronic order-entry programmes has been estimated to save up to \$9bn in the US.¹⁵⁷

Case study: Bourdeaux *et al* (2014)¹⁵⁸

Using ‘nudge’ principles for order set design: a before and after evaluation of an electronic prescribing template in critical care

Bourdeaux *et al* evaluated the impact of changes to the design of an order set on the delivery of chlorhexidine mouthwash and hydroxyethyl starch (HES) to patients in the intensive care unit (ICU). Chlorhexidine mouthwash should be prescribed four times per day in a ventilated patient but it was only when chlorhexidine was added to the prescribing template as a default that prescribing behaviour improved. Results from the study showed 55.3% of appropriate patients were prescribed chlorhexidine before the change and 90.4% after it. These changes were sustained over time.

Opt-out defaults also have the potential to change health care consumer behaviour. Individuals pre-scheduled for a flu vaccination are more likely to receive vaccination than those who simply have the option to make an appointment without being pre-scheduled.¹⁵⁰ It is conceivable that using opt-out defaults to influence appointment attendance and related behaviours beyond vaccination offers a promising behaviour change strategy.

Opt out defaults may also influence highly personal and significant decisions. In a small but instructive study¹⁵⁹ patients completed one of three types of end-of-life care options: a pre-selected option for comfort-oriented care, a pre-selected option for life-extending care and a standard option with no pre-selection. While most patients preferred comfort-oriented care the defaults influenced patient choice. For example, 77% of patients defaulted to comfort-oriented care stayed with the option while only 61% of those presented with the standard option chose comfort-oriented care. The authors suggest that patients may not hold strong preferences regarding end-of-life care and the application of defaults to advance directives may beneficially impact on resource use and quality of life.

While much attention has been given to opt-out defaults, they have a number of potential limitations:

- Because they rely on inaction, the individual affected may be less likely to follow up or commit to whatever they have agreed to.
- The defaults may not reflect the true preferences of the individual concerned.
- Particularly relevantly for this review, passive choices may be more likely to result in waste and inefficiency.¹⁶⁰

Case study: Keller *et al* (2011)¹⁶⁰

Enhanced active choice: a new method to motivate behavior change

Keller *et al* compared a variety of different defaults in the broad context of medication non-adherence. The default type options considered were opt-in, opt-out, active choice (forcing a choice with no default) and enhanced active choice (one alternative is favoured by highlighting the losses entailed by the non-preferred option), which might be understood as a variant of goal-framing and 'anticipated regret'. In one study, participants were asked in a hypothetical scenario if they would receive a 'flu shot' and in a second study participants were asked if they wanted to enrol in an automatic prescription refill programme. In the former study, opt-in, active choice and enhanced active choice were compared, with enhanced active choice the most effective intervention. In the latter study, opt-in was compared to enhanced active choice, with enhanced active choice found to be twice as effective. The authors suggest that active choice and enhanced active choice offer a cost-effective complement or alternative to traditional forms of default option.

Enhanced active choice has been proposed as a way to make health care providers choose between higher and lower cost alternatives of similar effectiveness when ordering tests, as a way to reduce waste. Further, in situations in which there is an obvious best value option it has been suggested that it may be appropriate to move beyond active choice options to actually modifying order entry sets, so that better value options are set as defaults.¹⁶¹ Something similar has been suggested in the context of patient decision aids, where nudges might be used where the evidence clearly indicates the superiority of one treatment option over another.¹¹⁸ Overall, the potential for the application of defaults to health care is likely considerable for both health care providers and consumers.

Figure 12: Examples of default options that may improve health care quality¹⁶²

Policy	Supportive data
In outpatient settings	
Routine HIV testing for all patients not recently tested unless they opt out	Branson <i>et al</i>
Automatic delivery of pharmaceutical prescriptions unless the physician opts out (not applicable to Drug Enforcement Agency-controlled medications)	—
In inpatient settings	
Annual influenza vaccination for all health care workers as a condition of employment unless they opt out in writing	Schnirring
Routine pneumococcal vaccination of all hospitalised patients for whom it is indicated as a condition of discharge, unless patient opts out	Department of Health and Human Services, Centers for Disease Control and Prevention
Removal of all urinary catheters after 72 hours unless a nurse or physician documents in the chart why a catheter should be retained	Cornea <i>et al</i>
In intensive care units	
Routine ventilation of all newly intubated patients with lung-protective settings unless or until other settings are ordered	The Acute Respiratory Distress Syndrome Network, Gajic <i>et al</i>
Adjusting the heads of all beds to a 30-to-45-degree incline unless a physician indicates otherwise (eg, for patients with hypotension or after cardiac catheterization)	Drakulovic <i>et al</i> , Kollef
Daily interruption of sedative infusions for all mechanically ventilated patients in the ICU unless otherwise indicated by a physician	Kress <i>et al</i>

From the health care provider perspective, Halpern *et al* point out that in addition to order sets and protocols, medication and diagnostic ordering, technological prompts like ICU alarms and communication strategies all rely on defaults.¹⁶³ In addition, there are likely patterns of practice that are effectively ‘hidden’ defaults contributing to inefficiency and waste. For example, The Critical Care Societies Collaborative’s Choosing Wisely Task Force Top 5 list contains several potentially wasteful and harmful practices. These include ‘daily laboratory tests or other diagnostics without clinical indications, sedating all mechanically ventilated patients, often deeply, and continuing life support for patients with poor prognoses.’¹⁶³

Case study: Waldron *et al* (2014)¹⁶⁴

An automated minimum retest interval rejection rule reduces repeat CRP workload and expenditure, and influences clinician-requesting behaviour

Although not a nudge, Waldron *et al* demonstrate how a default setting can reduce waste and implement guideline recommended behaviour. Measuring and charting C-reactive Protein (CRP) values can be useful in determining disease progress or the effectiveness of treatments. However, guidelines recommend CRP should not be repeated within a 24-hour period and repeated measurement on the same or consecutive days are of limited clinical value. Waldron *et al* evaluated the effect of an automated IT-based 48-hour minimum retesting rejection rule for managing repeat CRP requests, looking at laboratory workload, expenditure and clinician requesting behaviour. Over one year, there was a 7% and 12.3% decrease in CRP requests and CRP tests respectively following the introduction of the rejection rule compared to control. They estimated that this equates to an annual saving of £10,500 in revenue costs and propose that this strategy offers a cheap and sustainable method for reducing unnecessary repeat testing, as well as making clinician test-requesting behaviour more appropriate.

Given that defaults are so widespread and potentially powerful it is important that they are both recognised and, when altered, designed carefully. Careful design implies maximising the welfare of those affected by default options and that the selection of alternative and non-defaulted choices should be relatively easy. There is a tension inherent in the use of defaults given that what is the best option for a given patient may be highly individual. Option sets may be customised on the basis of patient specific information¹⁶⁵ (see Bansback *et al* on pages 26–27) but under certain conditions – for example, where the process of coming to a decision is important – defaults may not provide the best intervention strategy.

The importance of good default design is well illustrated by the phenomenon of ‘alarm fatigue’. While there are examples of the effective use of defaulted alerts (see Bourdeaux *et al* on page 32) – health care providers are subject to a large number of auditory and visual alerts that may create an unsafe patient environment and contribute to health care fatigue and distraction. In one 31-day study of an ICU, there were 2,558,760 unique alarms.¹⁶⁶ Another instructive study found that even with guideline-based default settings an ICU nurse hears only two of 32 clinically important alarms in an eight-hour shift and that adjusting existing default settings in terms of their technical relevance could reduce unnecessary alarms by 21.4%.¹⁶⁷

Halpern *et al* suggest that good quality evaluations of defaults in health care have been limited and there is much that is not known about this form of intervention.¹⁶³ Although there is a lack of conclusive evidence for or against the use of defaults in health care, the potential power of defaults to influence behaviour is clear. As such it is important to be careful when designing defaults – recognising their potential for negative unintended consequences such as decreased engagement in decision making or lack of individualisation of care – and evaluating them.

Incentivisation and coercion

In general, incentivisation may be understood as ‘creating expectation of reward’ and coercion as ‘creating expectation of punishment or cost’.³¹ Framing something as a gain or a loss might be considered a form of incentivisation or coercion respectively, but here we consider financial incentivisation and coercion. Although financial incentives are not strictly a nudge, so-called ‘micro-incentives’¹⁰ – small financial or material rewards – may be considered to be sufficiently nudge-like for inclusion here. We also consider behavioural contracts and commitments, which sometimes involve a financial component, as a form of incentivisation or coercion.

Financial micro-incentives

Financial micro-incentives may take a variety of forms including cash, vouchers, gifts, lottery prizes or social experiences, such as a day trip or a meal out.¹⁶⁸ Micro-incentives are typically provided contingent on the performance of some desired behaviour and some suggest they may have a sizeable impact on behaviour.¹⁰ For example, offering lottery tickets to patients on warfarin as reward for treatment adherence succeeded in almost eliminating the 20% of patients previously not taking their medication correctly.¹⁶⁹ Offering a US\$20 reward meant that college students were more likely to get a flu shot.¹⁷⁰ Systematic review evidence suggests that ‘even relatively small incentives’¹⁷¹ may be successful in influencing ‘one shot’ behaviours such as vaccination and screening. However, it is not necessarily possible to generalise to all such behaviours. For example, chlamydia testing – specifically return of chlamydia specimen samples – is unaffected by any form of financial incentive including vouchers, donations or lotteries.¹⁷²

Case study: Volpp *et al* (2015)¹⁷³

Automated hovering to improve medication adherence among myocardial infarction patients (Heartstrong)

Micro-incentives might also be used to influence more complex behaviours such as medication adherence. Volpp *et al* are currently evaluating an intervention to improve medication adherence in a high-risk patient population with acute myocardial infarction (AMI) immediately post-hospitalisation. The intervention has several components including Glow Caps (a remote monitoring and reminder pill bottle), a family member or friend acting as a support partner, and a medication adherence conditional lottery offering small \$5 and \$50 prizes. Although the study is ongoing, preliminary data suggest a substantial improvement in adherence.¹⁷⁴

Much instructive evidence around micro-incentives comes from a public health and lifestyle setting. A 2014 systematic review looking at the effectiveness of financial incentive interventions for encouraging healthy behaviour change across a range of behaviours (smoking cessation, attendance for vaccination or screening and physical activity) found financial incentives to be more effective in changing behaviour than no intervention or usual care.¹⁷⁵ A more recent review focusing on smoking cessation, weight loss and physical activity confirmed that financial incentives can help change behaviour but positive impact

lasts, 'at best, for up to three months after the incentives stopped and only when offered for stopping smoking, particularly during pregnancy'.¹⁷⁶ In addition, the variety of incentive and therefore the 'attainment certainty' (eg where vouchers are certain but lotteries uncertain) appears to have no differential impact on behaviour change¹⁷⁷ although it is premature to draw a conclusion from the existing evidence.

Financial incentives may also be effectively framed as either gains or losses. The idea that the fear of monetary loss produces 'a greater behavioural response'¹⁷⁸ than the prospect of monetary reward has been demonstrated to be true in some contexts. For example, paying teachers in advance and asking them to give back money if their students do not improve sufficiently has been demonstrated to have substantial impacts on student achievement.¹⁷⁹

Deposit contracts – in which individuals voluntarily deposit money into accounts which they can then only access upon reaching a specific goal – have been shown to help with weight loss, healthier eating and in one case increased the rate of successful smoking cessation by 40% after six months.¹⁸⁰ A more recent study of financial incentives for smoking cessation¹⁸¹ directly compared reward (provision of money on behaviour change) and deposit (participants put their own money at risk and recoup only if successful) contracts, as well as group and individual incentive programmes. The study suggested that rates of sustained abstinence from smoking were higher than usual across all treatments but reward-based programmes were much more acceptable than deposit-based programmes and therefore lead to 'higher rates of sustained abstinence' overall. Group-oriented incentives were found to be no more effective than individual-oriented incentives.

In the context of weight loss, deposit programmes – or Monetary Contingency Contracts (MCC's) – have been demonstrated to be effective. A recent systematic review found that MCC's have small-to-medium effects on weight loss with 'group refunds, deposit *not* paid as lump sum' and 'participant setting own deposit size' all associated with greater weight loss during treatment.¹⁸² However, consistent with behavioural maintenance evidence, these interventions help to promote weight loss and participant retention only up to the point that the incentive is removed.

Case study: Torchiana *et al* (2013)¹⁸³

Massachusetts General Physicians Organization's quality incentive programme produces encouraging results

Some suggest that incentive payments for a given goal are more effective in changing behaviour when they introduce the possibility of monetary loss, are separated from routine compensation and are provided in small, frequent amounts as opposed to a lump sum. The Massachusetts General Physicians Organization's quality incentive programme offered relatively modest financial incentives – up to 2% of a physician's annual income – for reaching performance targets for three quality measures every six months. Incentive payments were provided in advance of the measurement period and separately from regular pay cheques, introducing the prospect of monetary loss.

continued...

'Anecdotal evidence' from this study suggests that the programme 'facilitated the adoption of an electronic health record, improved hand hygiene compliance, increased efficiency in radiology and the cancer centre, and decreased emergency department use'. Furthermore, almost 80% of participating health care providers believed the programme had increased focus on quality of care and wanted it to continue.

On a related note, a recent review evaluated the relative efficacy of the World Health Organization campaign (WHO-5) to promote hand hygiene among health care workers in hospital settings.¹⁸⁴ WHO-5 consists of five components: system change, training and education, observation and feedback, reminders in the hospital, and a hospital safety climate. While the WHO-5 is effective, its effectiveness is enhanced further through various additional strategies including reward incentives – both non-financial and financial rewards for participants completing a particular task or reaching a certain level of compliance.¹⁸⁴

The use of financial incentives – whether 'micro' or not – may also be counterproductive or inappropriate in certain cases. Incentives might be counterproductive because they have the potential to undermine or 'crowd out' intrinsic motivation, which may result in poorer care. Although the psychological literature suggests that 'crowding out' may occur for simple tasks where motivation to perform the task is initially high, the 'existing evidence does not warrant *a priori* predictions that an undermining effect would be found for health-related behaviors.'¹⁸⁵ An example of where incentives may be inappropriate is mammography completion. The idea of incentivising this behaviour has been described as 'ethically troubling' because not all women screened benefit and there is potential for overdiagnosis and overtreatment given a proportion of cancers identified never become lethal. A suggested solution to this problem is to offer incentives for using optimised patient decision aids in order to make an informed choice for or against screening.¹⁰⁸

Behavioural contracts and commitments

Financial incentives may be understood as a specific type of contract and, specifically, a 'hard commitment', a device that uses 'real economic penalties for failure, or rewards for success'.¹⁸⁶ Reward, deposit and monetary contingency contracts are all forms of hard commitment. However, contracts and commitments may also be 'soft' – that is, involving a promise to do something without necessarily entering into a contract and without economic penalty. In fact, some suggest the two basic features of commitment devices are that individuals enter into them voluntarily and there must be consequences for failure to attain specified goals even if these consequences are not financial.¹⁸⁷ To provide more specific definitions, a behavioural contract may be understood as a 'written specification of the behaviour to be performed, agreed by the person, and witnessed by another' and a commitment asking a person 'to affirm or reaffirm statements indicating commitment to change the behaviour'.¹⁸⁸

Our search revealed one good quality systematic review by Bosch-Capblanch *et al.*¹⁸⁹ The review assessed whether ‘contracts between practitioners and patients really improve the patients’ adherence to treatment or their health status’, considered several types of contract and mainly considered the health problems of substance addictions, hypertension and being overweight. The authors suggest that there is insufficient reliable evidence to recommend routine use of contracts in health care to improve patients’ adherence, treatment completion or other outcomes, although some trials show contracts can have positive effects in some settings.¹⁹⁰

Contracts and commitments offer potentially powerful interventions but they suffer from a number of weaknesses, including low uptake and variable effectiveness. Rogers *et al* suggest a number of ways to overcome these problems.¹⁸⁷ Firstly, they suggest that low uptake could be due to a lack of awareness of the difficulty of acting on intention, which might be addressed through education or via other nudge-type interventions such as opt-out defaults. Second, because so many health-related behaviours require sustaining behaviour change over time, more effective forms of commitment devices may be needed to better engage individual attention – perhaps through other nudge-type interventions such as prompts, cues and reminders or feedback. They also suggest that forms of non-financial consequence, especially social consequences such as letting down peers, colleagues or family members, may offer effective enhancement. Finally, it is noticeable that making a contract or commitment could be understood as a kind of planning intervention and might be enhanced by using effective planning techniques.

Case study: Meeker *et al* (2014)¹⁹¹

Nudging guideline-concordant antibiotic prescribing: a randomised clinical trial

Evidence from various domains – recycling, charitable giving and voting – suggests that making a public commitment to perform a specific behaviour makes it more likely that one will act in line with intention. One of the reasons for this is that individuals seek to avoid social disapproval and therefore public commitment facilitates the sort of social consequence that Rogers *et al* suggest may provide an effective enhancement to commitment devices. Meeker *et al* sought to apply the principle of ‘public commitment’ to encourage the appropriate use of antibiotics for acute respiratory infections. The intervention consisted of poster-sized commitment letters displayed in examination rooms for 12 weeks, featuring clinician photographs and signatures stating a commitment to avoid inappropriate antibiotic prescribing. This intervention saw a 19.7% absolute reduction in inappropriate antibiotic prescribing compared to control. The authors suggest that this simple and low-cost intervention is comparable in magnitude to costlier, more intensive quality improvement efforts.

Enablement

Our literature search and expert interviews suggested a place for both audit and feedback and planning-type interventions in this review. Although neither of these intervention types are recognised in the House of Lords report or MINDSPACE, they might be understood as types of ‘enablement’, defined in the Behaviour Change Wheel as ‘increasing means/reducing barriers to increase capability or opportunity’.³¹

Audit and feedback

Audit and feedback is defined as ‘any summary of clinical performance of health care over a specified period of time’ to change health professional behaviour, as indexed by ‘objectively measured professional practice in a healthcare setting or healthcare outcomes’.¹⁹² Audit and feedback is widely used as a quality improvement tool based on the belief that ‘professionals are prompted to modify their practice when given performance feedback showing that their clinical practice is inconsistent with a desirable target’.¹⁹³ A Cochrane review of 140 randomised trials of audit and feedback across many conditions and settings¹⁹³ found this type of intervention leads to ‘a median 4.3% absolute improvement in provider compliance with desired practice’. But while a quarter of interventions had a relatively large, positive effect on care quality ‘another quarter had a negative or null effect’.¹⁹⁴

While audit and feedback used alone or in combination with other interventions is considered to be generally effective for improving appropriate care and prescribing outcomes,¹⁹⁵ there has been ‘little progress with respect to understanding their mechanisms of action or identifying their key “active ingredients”’.¹⁹⁴ Although an ‘ideal’ design for an audit and feedback intervention is dependent on recipient, context and target behaviour, Ivers *et al* propose a set of tentative ‘best practices’ when designing audit and feedback interventions, many of which could also be understood as nudge-type interventions or enhancements.

Figure 13: Tentative ‘best practices’ when designing audit and feedback interventions¹⁹⁴

Suggested tentative ‘best practices’		Nudge overlap
Feedback components	Presentation is multi-modal including either text and talking or text and graphical materials	Information design
	Delivery comes from a trusted source	Framing
	Feedback includes comparison data with relevant others	Framing
Target, goals and action plan	Target performance / behaviour is provided and goals set for the target behaviour are aligned with personal and organizational priorities and specific, measurable, achievable, relevant, time-bound	
	A clear action plan is provided when discrepancies are evident	Planning

Although these enhancements to audit and feedback interventions are presented as ‘tentative’ best practice enhancements, comparison data in particular has long been used as an effective way to change behaviour. In 2001, Kiefe *et al.*¹⁹⁶ used Achievable Benchmarks of Care (ABCs) – ‘standards of excellence attained by top performers in a peer group easily and reproducibly calculated from existing performance data’ – to improve care. The addition of ABCs to an existing ‘multimodal improvement intervention’ enhanced the effectiveness of feedback and resulted in improvements in flu vaccination, foot examination and long-term glucose control measurement. Consistent with the idea of ‘rank-framing’ the use of ABCs (comparison to the top 10% of peers) leads to greater improvement in processes of care than the use of median peer performance as a comparison.¹⁹⁴

Case study: Persell *et al* (2013)¹⁹⁷

Use of behavioural economics and social psychology to improve treatment of acute respiratory infections (BEARI): rationale and design of a cluster randomised controlled trial

Persell *et al* have designed an ongoing trial to try and reduce inappropriate antibiotic prescribing for acute respiratory infections (ARIs). The interventions include peer comparison of the ABC variety, ie each provider’s rate of inappropriate antibiotic prescribing relative to top-performing peers via periodic email; and two forms of prompt: ‘accountable justification’, a prompt to the clinician to record a justification for the prescription decision that appears in the electronic health record; and ‘suggested alternatives’, a list of non-antibiotic treatment choices delivered via computerised clinical decision support.

Planning

Almost half of individuals with intentions to engage in certain health-related behaviours – whether health care providers intending to follow guidelines or health care consumers intending to attend a screening – do not change their behaviour in order to meet their intentions.¹⁹⁸ Evidence suggests that specific, concrete plans¹⁹⁹ can help individuals overcome this ‘intention–behaviour’ gap.^{198,200} Planning is a reflective process but introducing prompts for and/or assistance in making plans offers a simple, cheap and often effective form of behaviour change intervention considered by some a ‘new entry into behavioral scientists’ existing arsenal of “nudges”.²⁰¹

Case study: Sallis *et al* (2015)²⁰²

The effectiveness of an enhanced invitation letter on uptake of National Health Service Health Checks in primary care: a pragmatic quasi-randomised controlled trial

Planning prompts (prompts to make simple plans) whether in the form of tear-off slips or a 'sticky note' have been shown to help overcome forgetfulness and increase uptake of health procedures such as immunisation, preventive screening and colonoscopy.²⁰³ In order to increase uptake, Sallis *et al* made a number of small changes to an invitation letter to attend NHS Health Check in Medway.* Two of the changes enhanced information design – making the language more behaviourally specific and using 'plain English' – but a third saw the addition of a tear-off slip for patients to record the date and time of their NHS Health Check – a prompt to make a simple plan that might also act as a reminder. Twenty-nine per cent of patients who received the original control letter and 33% of patients who received the intervention letter attended NHS Health Check, equating to a 13% increase in uptake.

Planning prompts may be understood as one relatively simple form of planning intervention. Other notable varieties referred to collectively as 'self-formulated conditional plans' include implementation intentions and action plans. Implementation intentions – 'specific "if/then" statements; for example, if I do X (have breakfast), then I will do Y (take my insulin)'²⁰⁴ are perhaps the best known and have been successful in changing a variety of behaviours. For health care consumers this includes increased attendance at cervical cancer screening²⁰⁵ and performing breast self-examination.²⁰⁶ For health care professionals it includes, though to a lesser extent, the use of a psychiatric care directive by mental health practitioners²⁰⁷ and improving hand hygiene compliance by professional nurses.²⁰⁸

Case study: Neter *et al* (2014)²⁰⁹

From the bench to public health – population-level implementation intentions in colorectal cancer screening

Early detection of colorectal cancer using faecal occult blood tests (FOBTs) reduces mortality, yet screening adherence remains low. The intervention in this study was a leaflet attached to a test kit containing an 'if/then' condition and planning instructions of when, where and how to use the test kit. Adherence in the experimental group was 1.2–6.6% higher than in the control group, and within six months of the mailing the test kits uptake was 71.4% and 67.9% respectively. This intervention is clearly promising given that it changes behaviour, is relatively low-cost and can be applied at a population level.

* The Department of Health Behaviour Change Team, some of whom were involved in this study, are exploring other variants of this approach including sending text messages a week before and after the invitation letter, using personalised slips, social comparison, providing feedback on the costs associated with non-attendance and pre-booking appointments.

Action plans require ‘goal-directed responses to situational cues by specifying when, where, and how to act in accordance with one’s goal intention’, but unlike implementation intentions they are not presented as ‘if/then’ statements.²⁰⁴ A clear action plan – preceded by effective goal setting²¹⁰ – is another of the enhancements to audit and feedback interventions suggested by Ivers *et al*; principles which Gould *et al* are currently applying to the development interventions for improving blood transfusion practice.²¹¹ Providing the means for monitoring goal progress may also enhance planning interventions, given that increased frequency of progress monitoring promotes goal attainment and behaviour change.²¹² One promising variant of action planning that uses another nudge principle is Brief Action Planning (BAP).²¹³ BAP provides a self-management support technique for improving clinical outcomes in chronic illness care and disease prevention that requires individuals to develop a specific plan before making a verbal commitment to that plan.

Systematic review evidence suggests that implementation intentions have a ‘positive effect of medium-to-large magnitude ($d = .65$) on goal attainment’²¹⁴ across a number of behavioural domains. Further, the few syntheses of the effects of specific forms of planning intervention on health conditions or behaviours – action plans for chronic obstructive pulmonary disease²¹⁵ and implementation intentions for physical activity²¹⁶ and healthy eating²¹⁷ – suggest these forms of planning intervention are effective. However, Squires *et al* report that there is a general ‘paucity’ of synthesised evidence summarising the effects of planning interventions with health care providers and consumers. They are currently addressing this gap.²⁰⁴

While planning interventions offer a very promising nudge-type behaviour change intervention they are far from guaranteed to be effective. For example, Lo *et al* designed an intervention based on implementation intention principles to encourage uptake of colorectal cancer screening but, consistent with previous studies of screening uptake in general population samples, found their intervention had no impact.²¹⁸ The authors attribute this to the fact that implementation intentions tend only to be effective for groups already motivated to perform a behaviour and that motivation, in this case, may have been lacking. Existing motivation or intention to perform a behaviour is one of a number of factors that determine the effectiveness of planning interventions.²¹⁹

Rogers *et al* have summarised when and why plan-making interventions are likely to be most effective (see Figure 14 overleaf).²⁰¹

Figure 14: When and why plan-making interventions are most effective²⁰¹

	Plan-making will be most potent when:	Because plan-making:
a	People already hold a strong intention.	Facilitates follow-through on pre-existing intentions.
b	Intentions are motivated by personal values (as opposed to external pressures).	Helps people overcome and avoid obstacles, enabling more effective pursuit of intentions that are important to the self.
c	People have thought about the positive consequences of achieving their intentions and the obstacles to achieving them.	Works best when people are committed to their intentions and understand the obstacles they face.
d	Intention fulfilment is relatively complicated, with at least a few obstacles.	Helps people follow through on intentions that they otherwise would struggle to fulfil.
e	People have not already made plans.	Is redundant for people who have already formed plans.
f	People are at high risk of forgetfulness.	Is most valuable to people who are most in need of follow-through aids.
g	There are limited time windows in which to perform the implementation behaviours.	Increases the likelihood of initiating specific behaviours in specific moments that are cognitively linked to the intentions.
h	The planning requires detailed thinking about how to overcome specific obstacles.	Fosters the development of strategies to overcome obstacles and makes those strategies more likely to be accessible exactly when they are most needed.
i	There are precise, unique moments when the implementation behaviours must be initiated.	Works best when the initiation of the plan is cognitively linked to a specific situation or moment.
j	The plans involve concrete implementation details.	Embeds plans in memory so that when concrete cues (eg, where, when) arise, the intentions are triggered in memory.
k	The plans are stated publicly.	Enhances commitment when declared to others.
l	There is only one intention about which plans are being formed.	Can highlight the difficulty of achieving a long list of intentions, thereby undermining commitment to all of the intentions.
m	Achieving intentions does not require being opportunistic.	Plan making can make people less adaptable when out-of-plan opportunities arise.
n	Intentions can be achieved with single or continuous actions (as opposed to with multiple discontinuous actions).	Plans that require multiple discontinuous actions are especially vulnerable to disruption.

Evidence overview

In this concluding section we provide a summary of evidence considering the overall quality of evidence, relevance of the evidence to health care, and evidence of behaviour change impact of particular nudge-type interventions. This summary is not the result of a formal assessment of evidence quality; it is merely intended to provide an indicative, at-a-glance overview of the state of the evidence around nudge-type interventions derived from our search.

Rating	Quality	Relevance	Impact
High	Good quality systematic review evidence	Clear evidence of application to health care	Clear evidence of behaviour change impact
Mixed	Mainly evidence from randomised trials; lack of systematic review evidence	Some evidence of relevance or application to health care	Variable evidence of impact on behaviour
Low	Limited evidence from randomised trials	Limited evidence of relevance or application to health care	Limited or no evidence of impact on behaviour

Intervention	Quality	Relevance	Impact
Framing (gains and losses)	High	High	Mixed
Framing (social comparison and norms)	Mixed	Mixed	Mixed
Information design	Mixed	High	Mixed
Prompts, cues and reminders	High	High	High
Defaults	Mixed	High	Mixed
Financial micro-incentives	High	Mixed	Mixed
Behavioural contracts and commitments	Mixed	Mixed	Mixed
Audit and feedback	High	High	High
Planning	High	Mixed	High

Overall, our search suggested that while there is much evidence of nudge-type interventions it is very variable in terms of quality, relevance to health care and impact. All of the intervention types outlined above appear to have some behaviour change potential if suitably applied. The interventions with the strongest evidence base in terms of quality, relevance and impact are prompts, cues and reminders – specifically reminders – and audit and feedback interventions. However, there is an obvious lack of systematic review evidence for certain interventions (eg, behavioural contracts and commitments) and a general need for more good quality studies and evidence synthesis. In addition, it is clear that even for reminders and audit and feedback interventions, there is much that is unknown about how to enhance such interventions and that nudge-type interventions and principles offer promising but under-researched enhancements. In reality, nudge-type interventions rarely appear as discrete entities and are often part of multi-component, if not complex, interventions. In addition to this, the evidence summarised is extremely diverse in terms of audiences and behaviours. This overview therefore provides only indicative conclusions about the overall state of the evidence.

4. Opportunities and considerations

In this section we outline a number of areas of inefficiency and waste that might benefit from the application of nudge-type interventions, before reflecting on some opportunities and considerations for those developing them.

Areas of inefficiency and waste in health care

The review process – both via literature search and through expert interviews – identified a number of areas of inefficiency and waste to which nudge-type interventions might be applied productively. The first three areas – adherence, attendance and take-up, and shared decision making – are concerned principally with changing health care consumer behaviour. The final four areas – overtreatment, discharge and handover, hospital-acquired infection, and evidence implementation – are concerned with changing health care provider behaviour.

Adherence

Estimates suggest that 30–50% of people prescribed medications for long-term, chronic conditions do not adhere to treatment. Non-adherence contributes to significant medication wastage, medication-related problems leading to hospital admissions in older people, as well as lower quality of life, morbidity, mortality and avoidable productivity losses.^{134,220,221} The WHO has described non-adherence as a ‘worldwide problem of striking magnitude’ and it has been suggested that improving patient medication adherence could save US\$269bn worldwide.²²²

A recent Cochrane review highlighted the lack of effective interventions in current practice with only five randomised controlled trials reporting improvements in both adherence and clinical outcomes, with no common intervention characteristics apparent.²²³ Despite this, there are a number of promising nudge-type interventions that might be applied to improving adherence including tailored messages,²²⁴ enhanced reminders (eg in terms of message content or timing reminders), brief action planning, and micro-incentives.¹⁷³ One of the most promising intervention strategies (in that it improves adherence and clinical outcomes as well as being cost-effective)²²¹ for influencing adherence behaviours is the Adherence Improving Self-Management Strategy (AIMS). Although a complex intervention it employs many nudge-type principles, including the use of electronic medication bottles with caps (MEMS-caps) that register date and time of pill bottle opening, providing patient feedback and the use of action planning.*

* Volpp *et al* (see page 36) are using a not dissimilar type of strategy to improve adherence, except they use Glow Caps rather than MEMS-caps and a family member or friend as a support partner rather than a nurse.

Attendance and take-up

More than 12m GP appointments and almost 7m outpatient hospital appointments are missed each year, with the cost of the former estimated at £162m per year and the latter at almost £750m per year.²²⁵ ‘Did not attends’ (DNAs) result in increased waiting times, inefficient use of staff and worse patient care. In addition, hospitals may try to compensate with potential negative unintended consequences.¹³² Closely related to attendance is take-up of existing health care programmes such as cancer screening or NHS Health Check. Such programmes often require a certain level of take-up to be cost-effective. For example, NHS Health Check requires 75% uptake but in 2013/14 only 49% of people offered received one.²²⁶

There is clear potential for the application of nudge-type interventions to attendance and take-up behaviours. This may be through reminders and/or invitations with enhancements such as the use of cost feedback information or planning prompts. Another promising attempt to develop enhanced invitations using nudge-type principles – in the context of the NHS Health Check – is the use by Forster *et al* of the Question Behaviour Effect (QBE). QBE is the idea that asking questions about a behaviour increases the likelihood that the behaviour will be performed – in this case via a questionnaire in conjunction with micro-incentives (a £5 retail voucher for the return of the questionnaire).²²⁷

Shared decision making

Care received often does not align with patient preference.^{228,229} Patient decision aids support shared decision making and help align care with patient preference. The use of patient decision aids has been demonstrated to be effective compared to usual care²³⁰ – with implications for improved quality of care and treatment adherence – as well as being cost-effective. Up to a fifth of patients who participate in shared decision making choose more conservative treatments than those who do not. One US study suggested that implementing shared decision making for only 11 procedures could result in savings of US\$9bn nationally over a 10-year period.²²⁸

Evidence for interventions that improve the adoption of shared decision making is limited although interventions targeting health care providers and consumers together rather than separately show most promise.²³¹ Micro-incentives may offer a way to encourage health care consumers to use patient decision aids in the first place¹⁰⁸ and there is clear potential for the application of nudge-type enhancements to conventional patient decision aids, especially in terms of their design.

Overtreatment

Treatment that has little evidence of benefit or is excessive in complexity, duration or cost is a source of considerable waste and inefficiency.^{232,233} Some estimates suggest that a fifth of mainstream clinical practice brings no benefit to the patient²³⁴ and one 2014 survey of doctors found that over half (53%) would order a hypothetical test that they knew to be unnecessary if a patient insisted.²³⁵ As discussed above, the simple provision of cost feedback may help reduce test ordering and this basic principle might be further enhanced using effective information design and framing, eg the price of one treatment visually depicted as being greater yet no more effective than another.¹⁶¹

One notable expression of overtreatment is the prescription of non-generic medicines. Generic medicines offer substitutes for branded medicines with the same quality, safety and efficacy but at 10–80% lower price. In England, generic prescribing rates have increased in recent years but there is thought to be room for greater efficiency.²³⁶ Some propose a role for defaults – active choice to force a choice between treatments based on cost and efficacy – or ensuring better value options are set as defaults with significant potential cost saving.¹⁵⁷ Other evidence suggests that financial incentives with educational interventions and audit and feedback all appear promising interventions in reducing the prescription of branded medicines.²³⁶

Discharge and handover

Inappropriate presentation at services puts unnecessary pressure on services, especially given difficulties in discharging patients safely and quickly.²³⁷ Improving discharge processes in particular would help to reduce readmissions, adverse events and costs.⁹⁹ Medical handover is a critical step in patient care in order to reduce the risk of medical errors and ensure continuity of care and patient safety. However, surveys of doctors suggest variously that handover is frequently of poor quality, that 15% of critical incidents arose from poor handover²³⁸ and that 31% experience clinical problems during a shift which could have been avoided with appropriate handover.²³⁹ Enhancing existing forms of communication (typically templates for discharge and handover) using simple nudge-type adjustments (specifically presentation of information and prompts) may help ameliorate both these problems to some extent.

Hospital-acquired infection

One in 16 people being treated on the NHS picks up a hospital-acquired infection.²⁴⁰ Such infections account for a large proportion of harms caused by health care,²⁴¹ complicate patient treatment and increase length of hospital stay. As a result, hospital-acquired infections are very costly, with one estimate suggesting they cost the hospital sector £930m a year.²⁴² Estimates suggest that appropriate hand hygiene among health care providers could prevent 15–30% of these infections but compliance rates are usually around 50%.²⁴³ Although there is no one-size-fits-all solution to this problem, various nudge-type interventions (ie, education, feedback and reminders) have all been shown to improve hand hygiene compliance.¹⁸⁴ Micro-incentives, social comparison and commitments – perhaps public commitments as in the case of Meeker *et al* (see page 39) – may offer further enhancements to conventional interventions.

Evidence implementation

Evidence-based practices take more than 15 years on average to be incorporated into general practice in health care and only about half reach widespread clinical use.²⁴⁴ Further, about 30–40% of health care consumers do not receive care according to available evidence.²⁴⁵ This represents a source of considerable inefficiency and waste.

As suggested earlier, despite evidence indicating that implementation of the ‘Sepsis Six’ care bundle within one hour of presentation can halve mortality, median implementation rates are 27–47%.¹⁵⁴ It has been estimated that appropriate implementation of the bundle

for 80% of patients in the UK would provide cost savings of £170m a year and save 10,000 lives.²⁴⁶ Steinmo *et al* have already begun to address this problem by developing an intervention to support implementation of the 'Sepsis Six' care bundle with a number of nudge-type components. These include promotional and educational documents such as posters, stickers and smart phone apps, as well as audit and group feedback on daily implementation rates displayed publicly in the staff break area.¹⁵⁴

More effective implementation of clinical guidelines offers another opportunity for increasing efficiency and waste reduction. For example, effective implementation of the national patient safety guideline to reduce the risk of feeding through misplaced nasogastric tubes in three hospitals resulted in estimated savings of £2.56m in one year.²⁴⁷ Recent systematic review evidence²⁴⁸ suggests that interventions which comprise local opinion leaders, audit and feedback and reminders are the most effective way of improving guideline implementation. It is conceivable that these broad intervention types might be further enhanced with nudge principles, such as the use of source credibility and social comparison as part of audit and feedback and prompts and reminders in a variety of formats – e.g. stickers, screensavers and posters – with key messages drawing on effective framing principles. In addition, implementation of guidelines may be improved through better design and simply increasing ease of access, eg through an app or the provision of boxes with all the necessary equipment to perform and document a specific procedure.^{49,249}

Overall

This list is far from exhaustive and does not seek to prioritise opportunities for the reduction of waste and inefficiency. However, it may be instructive to point out that a recent report – *Protecting resources, promoting value: a doctor's guide to cutting waste in clinical care* – suggests that a focus on three core areas (overuse of medication, overuse of diagnostics and reducing unplanned admissions) would do much to cut waste in clinical care.²⁵⁰

Finally, it is worth mentioning that the recent Carter Report suggested that £2bn could be saved by 2019–20 through procurement and medicines optimisation.²⁵¹ The report states that influencing 'decision making for choosing medical devices' could contribute to these savings, with one estimate suggesting £1m could be saved by 'changing behaviours and moving to less expensive dry powder inhalers for respiratory conditions instead of higher use of higher cost CFC-free inhalers'. This appears to be a good fit for the application of nudge-type interventions, perhaps most obviously default options.

Developing nudges

It is one thing to identify areas to which nudge-type interventions might be applied but another to develop appropriate and effective interventions. One of the main themes that emerged from the interviews was that no behaviour change intervention – whether a nudge or not – is guaranteed to work when applied in a health care context, however promising and exciting that type of intervention is. This echoes the long-standing idea that there are 'no magic bullets'²⁵² when it comes to changing professional practice.

There isn't a kind of mechanistic list of techniques that one can wheel out irrespective of the problem... there are some spectacular lack of successes in the implementation intention industry... it has to do with kind of thinking, 'Look I've got a planning intervention, I can wheel it out' rather than thinking kind of more carefully about, 'Look there are a whole series of problems that people may have. I need to work out what these problems are and what the literature would suggest are good solutions to these'. (Expert interviewee)

Implementation intentions are a good example because while very effective when appropriately applied, if parameters for effectiveness (such as a pre-existing intention to perform a behaviour) are not in place then the effectiveness of the intervention will be greatly reduced.²⁵³ Similarly, fear appeals are often expected to be generally effective,²⁵⁴ but they tend to be effective only when an at-risk population has high levels of self-efficacy. Use of fear appeals with an audience with low self-efficacy may be counterproductive.²⁵⁵

It is important to recognise the conditions under which certain interventions are likely to be more or less effective, but equally – if not more – important to understand the context in which an intervention is implemented.^{16,256} For example, while reminders are a generally effective intervention, whether they're delivered in an inpatient or outpatient setting has implications for how effective they are.¹²⁶ A related issue, expressed in various forms by our interviewees but summed up in a seminal contribution to the improvement literature is the need for caution in the application of nudge-type interventions without appropriate consideration of theory or analysis of a given situation:

... Interventions may be chosen merely because they represent either what has been done before or what is judged feasible. These interventions represent an 'off-the-shelf' option that is not informed by any explicit theory or prior analysis of the situation, but is merely informed by, at most, researchers' implicit theories or intuitions. In this situation the results are likely to be uninformative beyond the single setting of application.²⁵⁷

The most important part of intervention development is first understanding the behaviour one wants to change and the relevant behavioural context. Having conducted a theory-based 'behavioural analysis' it is then advisable to consider the full range of intervention or nudge options available before systematically selecting interventions.

An applied example: antibiotic prescribing

An instructive example of how to think through developing nudge-type interventions – in this case to support and improve antibiotic prescribing – is provided by Pinder *et al.*²⁵⁸ Initial behavioural analysis is conducted using the COM-B ('capability', 'opportunity', 'motivation' and 'behaviour') model to identify drivers for specific behaviours of interest. Another good example of this kind of analysis for the purpose of developing interventions to change adherence behaviours may be found in Jackson *et al.*²²⁰ On the basis of their behavioural analysis Pinder *et al* propose intervention opportunities in the short, medium and longer term to improve antibiotic prescribing. Reassuringly, all the suggested interventions use one or more nudges identified in this review (see Figure 15).

Figure 15: Intervention opportunities to improve antibiotic prescribing²⁵⁸

Term	Proposed interventions	Intervention description
Short	1. Feedback on GP prescribing behaviour	Framing Planning /commitment
	2. Online pledges for parent	Commitment
	3. Improving use of the TARGET antibiotic leaflet as 'no prescription'/ back-up prescription	Information design Framing
Medium	1. Substitution of antibiotic therapy	Framing Incentivisation
	2. Reducing patient appointments for self-limiting infections at GPs	Prompt, cue, reminder
	3. Advising patients on their antimicrobial usage	Framing
	4. Adding friction to prescribing	Environmental restructuring
	5. Guideline implementation and decision support	Prompt, cue, reminder
	6. Making back-up prescribing the default for respiratory infections	Default
	7. Improving the presentation of the TARGET clinical guideline	Information design
	8. Recording GP decision making	Environmental restructuring
	9. Design-led hospital prescription charts	Information design
Longer	1. Making antibiotic packaging salient	Information design Framing
	2. Presenting resistance as a societal threat	Framing
	3. Increasing the cost of antimicrobials	Incentivisation

The intervention 'Feedback on GP prescribing behaviour' provides a good example of how to draw on and contribute to a 'cumulative' scientific evidence base. This was a concern in the expert interviews because 'there are opportunity costs... when investigators test quality improvement interventions that do not build upon, or contribute toward, extant knowledge'.²⁵⁹ In this example it is possible to see an evidence-based augmentation of an audit and feedback intervention using nudge-type interventions.

Figure 16: Description of ‘Feedback on GP prescribing behaviour’ intervention²⁵⁸

Proposed intervention	Intervention description
Feedback on GP prescribing behaviour	Prescribing volumes would be collated centrally and an individual letter sent out (perhaps from the chief medical officer (CMO) and chief pharmaceutical officer) to each GP, asking them to reduce their use and highlighting the local contribution to an international problem. Their practice prescribing data would then be displayed along with suitable comparator practices, and they may then be asked to respond to the CMO’s letter by outlining why and what plans they have to reduce their prescribing. In this way, they will be making a pledge/commitment to improve their stewardship behaviour.

This intervention – an extension of that trialled by Hallsworth *et al* (see page 20) – is clearly consistent with a number of the audit and feedback enhancements suggested by Ivers *et al* (see Figure 13, page 40)¹⁹⁴ including ‘delivery comes from a trusted source’, ‘feedback includes comparison data with relevant others’ and, to some extent, ‘a clear action plan is provided when discrepancies are evident’, although as the authors suggest this might also be understood as a form of commitment.

Selecting nudges

Another set of criteria – APEASE – suggested by Michie *et al.*²⁶⁰ may offer a useful way to select interventions or nudges. APEASE is an acronym that stands for affordability, practicability, effectiveness (and cost-effectiveness), acceptability, side effects (and safety), and equity. Two of these criteria in particular, acceptability and equity, appeared to be important for the expert interviewees.

Survey evidence from the United States suggests that there is broad public support for nudges as long as they are perceived to be legitimately motivated and consistent with the interests and values of those affected.²⁶¹ However, should the motivations of the nudger be deemed suspect by those affected, such interventions may be subject to ‘reactance’ and rejection of the intervention.² Nudges that engage conscious, reflective thinking may also be more acceptable than those that affect automatic, unconscious processes.

Acceptability of nudge-type interventions may influence feasibility, impact and usefulness. For example, in the study of financial incentives for smoking cessation¹⁸¹ (discussed on page 37), participants were much more likely to accept reward-based incentive programmes than deposit-based incentive programmes (combined acceptance rate of 90% and 13.7% respectively). One interviewee pointed out that some nudge-type interventions might just not get off the ground if an intervention is unacceptable to those whose behaviour it seeks to change, in this case a type of audible reminder system that has been shown to be effective in improving hand hygiene.¹⁴⁴

The intervention was one that I don't think has ever been implemented... a colleague had organised a system whereby if a task had not gone on in the consulting room then there was a warning sound, a noise as the clinician left, and the clinicians didn't like it. (Expert interviewee)

Equity and the potential for nudges to introduce or exacerbate inequalities was another concern for interviewees. For example, concern about equity has been one of the principal objections to the recent idea of displaying the price for drugs costing more than £20 on drug prescriptions²⁶² – a good example of a nudge.

We actually have a lot of evidence of how to initiate behaviour change in the people that, if you look at it from a population level, do not need to change their behaviour in relation to others... So how do we develop interventions that will not increase health inequalities despite perhaps being effective if you just look at whether or not there is a difference between intervention and control group. (Expert interviewee)

Combining nudges

It is often the case that apparently simple interventions combine a number of different nudge-type components and more complex interventions combine non-nudges with nudges. This raises a question about what sort of combinations of intervention are the most effective for a given behaviour.

I think then the other issue is how do we sensibly combine interventions to get synergies... I think the key issue is trying to understand under what circumstances, what context we need either single simple or large complex interventions... (Expert interviewee)

The question of effective combination is a clear area of opportunity for development and greater understanding and there are some further clues in the wider literature. For example, Michie *et al.*²⁶³ found that interventions comprising the Behaviour Change Techniques (BCTs) of self-monitoring, goal setting and action planning were twice as effective as interventions that did not have these techniques in changing healthy eating and physical activity behaviours. More recently, Dusseldorp *et al.*²⁶⁴ reanalysed the data used by Michie *et al* for the purposes of identifying the most effective 'synergistic' combinations of BCTs. Their results suggest that the combination of BCTs referred to as 'provide information on the consequences', 'provide information about behaviour–health link' and 'use follow-up prompts' were the most successful in changing behaviour. The first and second BCT might be understood as a type of framing and the third as a prompt, cue or reminder.

Unfortunately there are relatively few examples of systematically identifying the component parts of effective interventions in a health care setting. The most comprehensive example available, at least according to our search, is the work of Ivers *et al.*¹⁹⁴ on audit and feedback. There are also other studies currently in progress that aim to 'identify active ingredients within trials of implementation interventions for diabetes care'²⁶⁵ and improve the 'design and reporting of behaviour change interventions for antimicrobial stewardship in hospitals'.²⁶⁶

While it may be tempting to develop interventions with as many nudge-type components as possible, ‘more behavioural insights are not always better’,²⁶⁷ with some evidence suggesting that the more persuasive techniques used as part of a communication strategy the greater the resistance to its message.²⁶⁸ Systematic review evidence on the relative efficacy of single- versus multiple-component suggests there is ‘no compelling evidence that multifaceted interventions are more effective than single-component interventions’.²⁶⁹

All intervention development and evaluation would benefit from better and clearer descriptions of the intervention in question and this is particularly true of interventions with a number of different component parts. Published descriptions of what behaviour change interventions consist of are often limited and make it more difficult for others to replicate them, reliably implement effective interventions and contribute to a cumulative scientific evidence base.

Effective intervention description requires going beyond a simple list of ingredients to accurately describing other relevant aspects of the intervention including ‘duration, dose or intensity, mode of delivery, essential processes, and monitoring.’²⁷⁰ For example, a recent, helpful meta-analysis²⁷¹ of the impact of mobile phone text messages – or short message services (SMS) – on health behaviours (from complex behaviours such as smoking cessation to simpler behaviours such as appointment attendance) specifically looked at the influence of these kinds of moderators on the efficacy of the intervention. The meta-analysis considered dose, message tailoring, directionality, category of health behaviour, complexity of behaviour and participant age. The review found evidence for the positive effect of SMS on healthy behaviour, but of the various moderators only ‘dose’* and specifically using multiple messages per day was found to affect intervention efficacy.²⁷²

One way to help deal with this common problem is to use the Template for Intervention Description and Replication (TIDieR).²⁷⁰ TIDieR provides a checklist and guide that can be used to structure intervention reporting and to assess completeness of intervention descriptions.

Sustaining nudges

A central question and challenge in behaviour change research is developing a better understanding of how and when interventions result in sustained behaviour change and especially whether change can be sustained beyond the delivery of a given intervention. The 2011 House of Lords Behaviour Change report explicitly commented on the lack of understanding around how behaviour change interventions affect behaviour in the longer term, and recommended that evaluation processes be designed in order to take this into account.³⁰ Unfortunately, much research assesses outcomes once, often very soon after an intervention is implemented²⁷³ and at most maintenance is tracked for a year or two post-intervention, the period in which intervention effects are often strongest.²⁷⁴ A lack

* Elsewhere, dose has been defined as message length or level of detail with frequency referring to the number of messages per day. See Cook PF, *et al.* A counselor in your pocket: feasibility of mobile health tailored messages to support HIV medication adherence. *Patient preference and adherence* 9 (2015): 1353

of longer-term evidence of efficacy is still an issue. For example, while there is evidence for the short-term effectiveness of electronic – especially SMS – reminders for chronic medication adherence, longer-term effects remain unclear.¹³¹

I do like the choice architecture stuff... I think the big difficulty with it is that you know, it's very sexy, but actually there's very little evidence that it has long-term effects. (Expert interviewee)

Many interventions do not achieve sustained behaviour change and without additional support, positive effects tend to diminish over time. It is challenging both to maintain a change that has removed a behaviour – especially where that behaviour has been part of an established routine or habit – and to introduce and sustain a new behaviour. Financial incentives provide an illustration of the latter. As suggested above, financial incentives can help change health behaviours but positive impacts only last ‘at best, for up to three months’ after the incentive stops.¹⁷⁶ This is consistent with theory given that ‘If a behaviour is continuously rewarded and the rewards are then withdrawn, the behaviour should be extinguished.’²⁷⁵ However, as Johnston points out, financial rewards may result in maintenance if they are withdrawn gradually rather than suddenly, or if rewards are provided intermittently rather than continuously, ie for some but not all desired behavioural responses.²⁷⁶

One frequently mentioned exception to the general rule that behaviour change is not sustained beyond the intervention period is the example of Opower’s Home Energy Reports (HERs) (see page 18). The intervention, designed to encourage household energy conservation, consisted of ‘personalized feedback, social comparisons, and energy conservation information.’⁶⁷ Households receiving the intervention for the first time reduced electricity use, but this immediate reaction was not sustained in the time between reports.^{*} However, as households received more reports over a period of years this ‘backsliding’ behaviour reduced, and when one group of randomly selected households had their HERs discontinued those households continued to use less energy than those that did not receive HERs. This persistent effect is attributed to households forming a new ‘capital stock’, whether physical capital such as new energy efficient lightbulbs or consumption capital such as new energy use habits.⁶⁷ Frey and Rogers extend the idea of ‘capital stock’ and propose four ‘persistence pathways’ that provide a possible framework for understanding how and when interventions may lead to sustained behaviour change.²⁷⁷

^{*} Reports are mailed to households monthly or every few months.

Figure 17: Frey and Rogers' 'persistence pathways'²⁷⁷

Pathway	Definition
Habit	Treatment produces an automatic tendency to repeat a particular behavioural response, triggered by a stable context in which the behaviour is performed.
Changing how or what people think	Treatment permanently changes an element of how or what people think (for example, beliefs, identities, interpretations) that is causally consequential for the target behaviour.
Changing future costs	Treatment induces people to perform behaviours that change the costliness of a future target behaviour; the treatment may decrease the cost of performing a target behaviour, or increase the cost of failing to perform a target behaviour.
External reinforcement	Treatment induces people to perform a behaviour that then exposes them to ongoing external processes (including social processes) that they would not have been exposed to otherwise; these external processes cause the changed behaviour to persist.

Habit provides arguably the most convincing explanation of 'persistence.' Psychological research has shown that repetition of a simple action in a stable context results in an action being activated by contextual cues.²⁷⁸ As a result, even initially reflective behaviours can become habitual and automatic through repeated performance and may persist even when motivation or interest disappears.²⁷⁹ Certainly, psychological habits have been recognised as contributors to the repetition of high frequency health behaviours such as diet and exercise and may also be particularly relevant to health professional behaviours which may be repeated numerous times on a daily basis.²⁷ Interventions that promote habit formation may therefore offer a particularly promising approach for promoting sustained behaviour change^{280,281} and may be used productively in conjunction with planning interventions.²⁷ Of course, some interventions – notably defaults – induce people to automatically perform a behaviour without necessarily requiring habit formation. In the case of Bourdeaux *et al* (see page 32) a simple default resulted in sustained and desirable behaviour change for at least two years after the introduction of the intervention.

'Habituation' – the process by which repeated exposure to a specific stimulus results in desensitization and decreased behavioural response²⁸² – presents a challenge for sustaining behaviour change. Further, with the exception of a few frequently cited studies there is little in the way of evidence specifically considering habituation to nudges.

If somebody could actually run a study on nudges over a longer period than a week or a month it will be interesting to see, do people actually habituate to nudges...
(Expert interviewee)

However, there are clues in the wider behaviour change literature with implications for the effective design of nudge-type interventions. For example, habituation may be reduced if stimuli are not repeated too frequently and at either sufficiently long or unpredictable intervals and if the sensory properties of the stimulus are dynamic or sufficiently intense.^{282,283}

Some evidence suggests that dynamic content may be particularly important in developing engaging interventions that resist habituation. One instructive study using text messages to reduce adolescent pregnancy found that an interactive intervention – involving quiz questions and financial micro-incentives – was particularly effective in increasing knowledge as well as sustaining greater levels of knowledge over time.²⁸⁴ Another study of the impact of smartphone delivered tailored messages to support HIV medication adherence suggested that a simple ‘novelty effect’ as a result of changing message content might account for observed improvements in adherence.²²⁴ The authors go on to suggest that instead of developing tailored motivational messages it may be more effective to simply develop a range of novel messages to keep recipients' attention using available features of smartphone technology, such as video, audio, interactive formats and ‘gamification strategies’.

Although some question whether it is even realistic to expect long-term maintenance of behaviour change,²⁷⁴ an important place to start may be recognising the difference between processes for initiating and maintaining a behaviour.²⁸⁵ As Johnston points out, sustained behaviour change is more likely if the maintenance behaviour has been defined and rewarded and the maintenance phase is not implemented too suddenly.²⁷⁶

I think what's interesting is how do you put maintenance at the heart of the intervention development process, because I think that [with] interventions where you have maintenance already within the process you have a better quality change compared to if you initiate change and then you just have a bolt-on and say 'Now we focus on maintenance...' (Expert interviewee)

How to best sustain behaviour change during and post-intervention is still an open question. There is certainly an opportunity to evaluate over longer periods, to better understand maintenance as well as the most effective intervention combinations for sustaining behavioural change. This would, in turn, support cost-effective intervention design and implementation.

5. Conclusion

The appeal of nudging remains ‘self-evident’²⁸ given that it offers simple, low-cost forms of intervention that are often more acceptable than traditional policy instruments. However, the evidence for the application of nudge-type interventions in health care is highly variable in terms of quality, relevance and impact. What evidence there is indicates that there is much innovation and development in this area and there is evidence enough to suggest that nudge-type interventions have considerable potential to change health care behaviours that drive inefficiency and waste.

A recent overview of professional behaviour change in health care suggests that the most promising behaviour change interventions are those that modify and/or reinforce peer group norms and expectations by emphasising the expectations of an external reference group.⁴⁰ It also suggests that combining certain interventions – particularly audit and feedback and reminders* – is most likely to change health care professional behaviours. This evidence is consistent with that presented in this review but, as the overview’s authors point out, their conclusions should only be considered indicative.

Even for interventions with the strongest evidence base, like audit and feedback and reminders, there is still much that is not known about optimising such interventions, whether through altering moderators such as ‘dose’ and timing or enhancement through combination, perhaps with other nudge-type interventions. There is a clear need for more good quality evaluation and evidence synthesis of these types of intervention to test what are currently indicative conclusions and gaps in the evidence base. One interviewee suggested that there is a particular gap in the evidence around specific intervention types across a broad range of behaviours.

One thing I think could usefully be done is systematic reviews of specific types of intervention... what you see is a systematic review of interventions for weight management, what you don’t see is systematic reviews [of interventions] across behaviours... (Expert interviewee)

Just as there are no ‘magic bullets’ when it comes to interventions, many problems within health care – including those highlighted above in the opportunities section – may be ‘problematic problems’⁹⁸ that are complex and resist any simple solution. Indeed, a recurrent concern in the expert interviews was that nudges – as relatively simple interventions – may not be suitable or useful when applied to these kinds of challenges.

We waste an awful lot of people’s time and energy doing stupid things or doing them very badly but to solve them is not straightforward... a very obvious example where we waste people’s time and we cause risk is discharges from hospitals,

* They also suggest educational outreach, ie face-to-face visits, but this is not a nudge-type intervention included in this review and is arguably more a mode of delivery.

handover between hospitals and care homes, handover between hospitals and people's own homes – that kind of thing doesn't seem to me like something that is necessarily tractable to a simple nudge... (Expert interviewee)

Clearly this is a legitimate concern but there is suggestive evidence that simple nudge-type enhancements may, for example, improve discharge processes and offer enhancements to, or valuable components of, more complex interventions. It is also conceivable that sometimes scepticism toward nudge-type interventions may reflect a bias against simple solutions.

We're biased to try and find complex solutions to complex problems, and we just ignore the obvious things that come to us which we just aren't very good at doing. Behavioural insights come in there, into that stage, so I think, it just delivers what we should be doing anyway. (Expert interviewee)

Critics suggest that nudge-type interventions typically achieve modest behavioural change and that these types of interventions are rarely powerful on their own.²⁸⁶ Even if this is true, nudge-type interventions still have considerable potential to improve efficiency and reduce waste and that potential is worth exploring further. However it is vital that the development of nudge-type interventions explicitly builds on existing relevant research and theory and that interventions are described fully and accurately.^{194,259} Without this, the time and resource spent developing and evaluating nudge type interventions will likely represent yet another form of inefficiency and waste within health care.

6. Appendix

Literature search methodology

The search strategy had three components.

First, we identified a number of prominent reports and/or articles that discussed the application of nudging, behavioural economics or behavioural insights to a wide range of, typically policy, areas. We hand-searched and snowballed from these sources to identify relevant content.

Second, we undertook an electronic search via Ovid MEDLINE but searching Embase, PsycINFO and Cochrane Library. Results were retrieved from 1990 to February/March 2015.

The search terms used were:

General:

- nudge
- choice architecture
- behavioural economics
- behavioural insights
- behaviour change

Quality outcomes:

- efficiency OR inefficiency
- cost
- waste
- quality OR quality improvement

Interventions:

- incentives OR disincentives
- persuasion
- information
- default
- social norms OR norms OR social comparison
- salience
- commitment OR commitment contract
- messages OR messaging

An initial search identified more than 10,000 pieces of potentially relevant research. After screening of abstracts, removal of duplicates and application of exclusion criteria (ie, intervention had to be nudge-like; simple; relevant to either a health care provider or health care consumer; relevant to a health care context, principally primary or secondary care; UK or proxy setting; English language) 210 records were included.

Third, we used expert interviews as a way to identify relevant literature.

Expert interviewees

Dr Chris Bourdeaux, Consultant Intensivist, Bristol Royal Infirmary

Professor Marijn de Bruin, University of Aberdeen

Dr Alexandra Clarke, University College London

Professor Mary Dixon-Woods, University of Leicester

Dr Stephan U Dombrowski, University of Stirling

Professor Rhona Flin, University of Aberdeen

Professor Jill Francis, City University London

Professor Dr Jeremy Grimshaw, Ottawa Hospital Research Institute and University of Ottawa

Michael Hallsworth, Director, Health and Tax, Behavioural Insights Team

Professor Robert Horne, University College London

Professor Marie Johnston, University of Aberdeen

Professor Rebecca Lawton, University of Leeds

Professor Martin Marshall, University College London

Professor Theresa Marteau, University of Cambridge

Professor Anne E Rogers, University of Southampton

Professor Martin Roland CBE, University of Cambridge

Professor Nick Sevdalis, Imperial College, London

Dr Natalie Taylor, Macquarie University

Professor Charles Vincent, University of Oxford

Dr Thomas Webb, University of Sheffield

Professor Dr Michel Wensing, Heidelberg University Hospital

Professor Robert West, University College London

Professor Lucy Yardley, University of Southampton

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