

2019-06-21

# Understanding the Role of the Public in Reducing Low-value Care

Sypes, Emma Elizabeth

---

Sypes, E. E. (2019). Understanding the Role of the Public in Reducing Low-value Care (Master's thesis, University of Calgary, Calgary, Canada). Retrieved from <https://prism.ucalgary.ca>.  
<http://hdl.handle.net/1880/110526>

*Downloaded from PRISM Repository, University of Calgary*

UNIVERSITY OF CALGARY

Understanding the Role of the Public in Reducing Low-value Care

by

Emma Elizabeth Sypes

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF SCIENCE

GRADUATE PROGRAM IN COMMUNITY HEALTH SCIENCES

CALGARY, ALBERTA

JUNE, 2019

© Emma Elizabeth Sypes 2019

## Abstract

Low-value care consists of medical tests and treatments that are unnecessary, potentially harmful, or not cost-effective and contribute to rising healthcare costs, adverse events, and poor quality of care. In recent years there has been a surge in initiatives aiming to identify and reduce low-value care. However, the role of the public in reducing low-value care remains unclear. The research reported in this thesis aimed to understand the role of the public in reducing low-value care through a systematic and comprehensive review of the literature. A scoping review identified 151 relevant articles. The majority of these articles described or evaluated a strategy for involving the public in reducing low-value care; articles that explored stakeholder perspectives about the role of the public were less common. Public involvement most commonly occurred at the level of the patient-clinician interaction, followed by administrative and policy decision-making and low-value care research. Shared decision-making and patient-oriented education were the most frequent and best supported strategies. There was considerably less support for public involvement at the level of administrative and policy decision-making. A follow-up systematic review and meta-analysis was conducted to estimate the impact of patient-targeted interventions to reduce low-value care. This study found a statistically significant association between patient-targeted interventions (i.e., shared decision-making, patient-oriented education) and a decrease in use of the low-value practices (RR 0.75; 95% CI 0.66-0.84), which remained significant when the meta-analysis was restricted to randomized clinical trials with low risk of bias (RR 0.69; 95% CI 0.58-0.83). Collectively, these two studies show a considerable amount of support for engaging the public in reducing low-value care at the level of the patient-clinician interaction through strategies including shared decision-making and patient-oriented education. There is

comparably less evidence to support public involvement in research or administrative and policy decision-making. Additional research to explore stakeholder perspectives and evaluate strategies for public involvement within varying contexts is required to further understand the role of the public in reducing low-value care.

## Preface

The following manuscripts have been submitted for publication or are in preparation to be submitted for publication. For each manuscript, EES conducted and interpreted the analyses, and wrote the manuscript. The supervisory committee (JPL, FMC, DJN, HTS) provided supervision for both manuscripts. Both manuscripts are reproduced in their entirety as chapters in this thesis.

Sypes, EE, de Grood, C, Parsons Leigh, J, Clement, FM, Stelfox, HT, Niven, DJ.

Understanding the role of the public in reducing low-value care: A Scoping Review.

*Under peer review.*

Sypes, EE, de Grood, C, Whalen-Browne, L, Parsons Leigh, J, Clement, FM, Niven, DJ,

Stelfox, HT. Patient-targeted interventions to reduce low-value care: A Systematic

Review and Meta-analysis. *Under peer review.*

## **Acknowledgements**

I owe tremendous thanks to the many people who have supported me throughout the past two years. To my supervisors, Dr. Stelfox and Dr. Niven, I am sincerely grateful for your mentorship and guidance. Thank you for providing me with challenges and opportunities that have greatly influenced my personal and professional development. I also wish to thank my supervisory committee members, Dr. Clement and Dr. Parsons Leigh, for dedicating their time and providing invaluable input that has shaped this research. To the staff, faculty, and trainees in the Department of Critical Care Medicine, thank you for creating such a welcoming and supportive environment for working and learning. Thank you to all of my friends, old and new, for shaping, encouraging, and inspiring me. To Natalie Scime and Chloe de Grood, this experience would not have been the same without the two of you. Lastly I wish to thank my entire family for their unwavering support and encouragement. To my sister, Abby, you have lead by example with your perseverance and determination. To my parents, Jeff and Shelley, thank you for giving me the experiences and opportunities that have lead me to where I am today.

## Table of Contents

|  |     |
|--|-----|
| Abstract .....   | ii  |
| Preface.....   | iv  |
| Acknowledgements.....  | v   |
| Table of Contents .....  | vi  |
| List of Tables .....   | ix  |
| List of Illustrations, Figures, & Graphics .....   | x   |
| List of Symbols, Abbreviations & Nomenclature.....   | xii |
| CHAPTER ONE: INTRODUCTION.....   | 1   |
| 1.1 The importance of identifying and reducing low-value care .....                                  | 2   |
| 1.1.1 Defining low-value care.....   | 2   |
| 1.1.2 How low-value care impacts the Canadian healthcare system .....                                | 2   |
| 1.1.3 Three imperatives for identifying and reducing low-value care .....                            | 3   |
| 1.2 Past and present approaches towards reducing low-value care .....                                | 4   |
| 1.2.1 Healthcare administration and policy responses to low-value care .....                         | 4   |
| 1.2.2 Initiatives to reduce low-value care within clinical interactions .....                        | 5   |
| 1.2.3 Understanding the challenges associated with reducing low-value care .....                     | 7   |
| 1.3 The role of the public in reducing low-value care .....  | 8   |
| 1.3.1 Members of the public are key stakeholders in the initiative to reduce low-value care .....    | 9   |
| 1.3.2 The public’s perception of low-value care.....   | 9   |
| 1.3.3 Engaging the public in initiatives to reduce low-value care .....                              | 11  |
| 1.4 Rationale .....  | 12  |
| 1.5 Conceptual Framework.....  | 14  |
| 1.6 Thesis structure .....   | 16  |
| CHAPTER TWO: UNDERSTANDING THE ROLE OF THE PUBLIC IN REDUCING LOW-VALUE CARE: A SCOPING REVIEW ..... | 17  |
| 2.1 Abstract.....  | 18  |
| 2.2 Introduction.....  | 20  |
| 2.3 Methods.....   | 22  |

|   |            |
|---|------------|
| 2.3.1 Data Sources and Searches .....   | 22         |
| 2.3.2 Study Selection .....   | 23         |
| 2.3.3 Data Extraction and Quality Assessment.....   | 24         |
| 2.3.4 Data Synthesis and Analysis .....   | 24         |
| 2.4 Results.....  | 25         |
| 2.4.1 Citation Selection.....   | 25         |
| 2.4.2 Study Characteristics and Classification within Conceptual Frameworks .....   | 25         |
| 2.4.3 Inclusion of the Public in Strategies that Aim to Reduce Low-value Care .....                                       | 26         |
| 2.4.4 Stakeholder Perceptions Regarding Public Engagement in Reducing Low-value Care .....                                | 28         |
| 2.5 Discussion.....   | 29         |
| <b>CHAPTER THREE: PATIENT-TARGETED INTERVENTIONS TO REDUCE LOW-VALUE CARE: A SYSTEMATIC REVIEW AND META-ANALYSIS.....</b> | <b>101</b> |
| 3.1 Abstract.....   | 102        |
| 3.2 Introduction.....   | 104        |
| 3.3 Methods.....  | 104        |
| 3.3.1 Protocol and Guidance .....   | 104        |
| 3.3.2 Search Strategy and Data Sources .....  | 105        |
| 3.3.3 Article Eligibility and Selection.....  | 105        |
| 3.3.4 Data Extraction and Risk of Bias Assessment .....   | 106        |
| 3.3.5 Synthesis .....   | 107        |
| 3.4 Results.....  | 108        |
| 3.4.1 Study Selection .....   | 108        |
| 3.4.2 Study Characteristics .....   | 108        |
| 3.4.3 Patient-targeted Interventions and Use of Low-value Care.....   | 109        |
| 3.4.4 Quality Assessment.....   | 110        |
| 3.4.4.1 Randomized Clinical Trials .....  | 110        |
| 3.4.4.2 Non-randomized studies .....  | 111        |
| 3.4.5 Exploration for Sources of Heterogeneity .....  | 111        |
| 3.5 Discussion.....   | 112        |
| 3.5.1 Strengths and Limitations .....   | 115        |



|   |     |
|---|-----|
| 3.6 Conclusions.....  | 116 |
| CHAPTER FOUR: CONCLUSIONS.....  | 135 |
| 4.1 The state of the literature on public involvement in reducing low-value care.....                   | 136 |
| 4.2 Identified strategies for public involvement in reducing low-value care and their implications..... | 137 |
| 4.3 Next steps to further our understanding of the role of the public in reducing low-value care .....  | 138 |
| 4.4 Conclusions.....  | 141 |
| References.....   | 143 |

## List of Tables

|   |     |
|---|-----|
| Table 1.1 Conceptual framework.....   | 15  |
| Table 2.1 Conceptual framework for data charting .....  | 35  |
| Table 2.2 MEDLINE (Ovid) Search Strategy.....   | 36  |
| Table 2.3 Information sources accessed through the Canadian Agency for Drugs and<br>Technologies in Health (CADTH) Grey Literature Search Tool..... | 37  |
| Table 2.4 Characteristics of citations included in the review (n=151) .....   | 42  |
| Table 2.5 Characteristics of included citations (n=151) .....   | 92  |
| Table 2.6 Stakeholder perspectives on how the public should be involved in reducing<br>low-value care.....  | 93  |
| Table 3.1 MEDLINE (Ovid) Search Strategy.....   | 117 |
| Table 3.2 Characteristics of included studies (n=18).....   | 118 |
| Table 3.3 Risk of bias and quality assessment of included randomized clinical trials ...  | 125 |
| Table 3.4 Quality assessment for non-randomized interventions using the Downs & Black<br>tool (n=10) .....  | 126 |
| Table 3.5 Results from meta-regression analysis .....   | 128 |

## **List of Illustrations, Figures, & Graphics**

|  |     |
|--|-----|
| Figure 1.1 Conceptual model for the process of de-adoption.....  | 14  |
| Figure 2.1 Selection of studies included in the review .....   | 96  |
| Figure 2.2 Year of publication of included studies (n=151).....  | 97  |
| Figure 2.3 Classification of included studies (n=151) according to main components of the conceptual framework and level of public engagement.....   | 98  |
| Figure 2.4 Strategies for public involvement in reducing low-value care identified from included citations, according to main components of the conceptual framework and level of public engagement.....   | 99  |
| Figure 2.5 Reported utility of strategies for public involvement in reducing low-value care studies.....   | 100 |
| Figure 3.1 Selection of articles included in the review.....   | 129 |
| Figure 3.2 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices by study design .....                        | 130 |
| Figure 3.3 Funnel plot with pseudo 95% CIs .....   | 131 |
| Figure 3.4 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices by low-value practice .....                  | 132 |
| Figure 3.5 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices by the strategy for patient involvement..... | 133 |

Figure 3.6 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices in RCTs, by summary risk of bias assessment ..... 134

### **List of Symbols, Abbreviations & Nomenclature**

|            |   |
|------------|---|
| CADTH      | Canadian Agency for Drugs and Technologies in Health  |
| CIHI       | Canadian Institute for Health Information   |
| CINAHL     | Cumulative Index to Nursing and Allied Health Literature  |
| CT         | Computed Tomography   |
| ED         | Emergency Department  |
| MRI        | Magnetic Resonance Imaging  |
| NHS        | National Health Service   |
| NICE       | National Institute for Health and Clinical Excellence   |
| PRESS      | Peer Review of Electronic Search Strategies   |
| PRISMA     | Preferred Reporting Items for Systematic Reviews and Meta-Analyses                                  |
| PRISMA-ScR | Preferred Reporting Items for Systematic Reviews and Meta-Analyses<br>extension for Scoping Reviews |
| RCT        | Randomized Clinical Trial   |
| RR         | Risk Ratio  |

## **CHAPTER ONE: INTRODUCTION**

## **1.1 The importance of identifying and reducing low-value care**

Evidence suggests that certain tests and treatments that were once thought to be safe and effective may no longer be considered best practices. The continued use of these *low-value* practices means that patients may be undergoing tests and receiving treatments that are unnecessary or potentially harmful. Reducing the use of *low-value care* is therefore imperative in the pursuit of sustainable, high-quality healthcare.

### ***1.1.1 Defining low-value care***

*Low-value care* has been defined as, “An intervention in which evidence suggests it confers no or very little benefit for patients, or risk of harm exceeds probable benefit, or, more broadly, the added costs of the intervention do not provide proportional added benefits.”<sup>1</sup> For the purpose of this thesis and the research contained within, this definition of low-value care is interpreted to include three potential characteristics of low-value practices: 1) lack of efficacy; 2) potentially harmful; and 3) not cost-effective. It is important to note that these three characteristics are not mutually exclusive. For example, a commonly known low-value practice is diagnostic imaging for low-back pain;<sup>2,3</sup> it is often unnecessary in patients without red flag symptoms or signs<sup>4</sup> (i.e., lack of efficacy) and simultaneously exposes patients to radiation (i.e., potentially harmful).<sup>5,6</sup>

### ***1.1.2 How low-value care impacts the Canadian healthcare system***

Low-value care is prevalent within the Canadian healthcare system. Data from the Canadian Institute for Health Information (CIHI) suggests that Canadian patients may receive up to one million unnecessary tests and treatments each year. These include

practices such as inappropriate medications, preoperative testing, and diagnostic imaging tests.<sup>7</sup> Overall, approximately 30% of healthcare may be low-value;<sup>7</sup> this is a significant proportion in a healthcare system that faces challenges including high cost and poor access to resources.<sup>8</sup>

Take for example the aforementioned low-value practice of unwarranted diagnostic imaging for low-back pain. Canada ranks 22<sup>nd</sup> out of 27 countries with universal healthcare for availability of magnetic resonance imaging (MRI) units and, as a result, barriers such as wait times and travel prevent timely access for patients requiring an MRI.<sup>8</sup> In addition, diagnostic imaging tests are expensive.<sup>9</sup> Therefore, several trickle-down effects may be felt throughout the system when an MRI is ordered for a patient whose clinical criteria doesn't actually require one: the added demand for a scan could increase wait times; the system incurs an unnecessary cost; and the scan could reveal incidental or false-positive findings that lead to the consumption of additional resources. These consequences have implications for both the quality and sustainability of Canadian healthcare.

### ***1.1.3 Three imperatives for identifying and reducing low-value care***

Elshaug and colleagues have described three imperatives for identifying and reducing low-value care.<sup>10</sup> First, care providers have an ethical responsibility to provide care that is safe for their patients; administering tests and treatments that may be directly or indirectly harmful could jeopardize patient safety. Second, an important pillar of healthcare quality is to ensure the use of best practices. Low-value tests and treatments



that do not meet healthcare needs or are not based on best-evidence are considered low-quality healthcare.<sup>11</sup> Third, spending money on low-value care is wasteful. In addition to the direct costs of low-value tests and treatments one must also consider the downstream costs of follow-up or repeat testing.<sup>12</sup> Low-value care therefore represents a substantial amount of spending that could be directed towards high-value care. This cost imperative may apply to various stakeholders, such as governments, insurance companies, taxpayers, and patients, depending on the nature of the healthcare system. These ethical, quality, and cost imperatives have gained recognition around the globe and prompted initiatives to identify and reduce low-value care.

## **1.2 Past and present approaches towards reducing low-value care**

The identification of low-value practices has been followed by the emergence of initiatives aiming to reduce their use. Examples of these initiatives range from the level of government, where decisions are made to disinvest from low-value practices, to local health systems, who tailor interventions to target the use of a low-value practice to their own context and circumstances. Many of these initiatives, however, face common challenges including generating and understanding evidence to classify practices as ‘low-value’, navigating barriers to behavior change, and effectively engaging all key stakeholders.

### ***1.2.1 Healthcare administration and policy responses to low-value care***

The focus on identifying and reducing low-value care has been growing for nearly twenty years. In the early 2000s, the United Kingdom’s National Institute for Health and Clinical

Excellence (NICE) piloted a program to identify ineffective care within the National Health Service (NHS).<sup>13</sup> The overarching goal of this program was to reduce the use of ineffective care and cut costs.<sup>13</sup> Since then, other countries with publicly funded healthcare systems have adopted similar initiatives. Australia, for example, has implemented the Comprehensive Management Framework to review the clinical effectiveness of items covered by their Medicare Benefits Schedule.<sup>14</sup> However, these large-scale initiatives have encountered the challenge of a lack of data to support the decision to disinvest and monitor the use of the practice if prioritized for disinvestment. Another challenging aspect is the variation in the value of a practice depending on the context of the patient, which makes it difficult to suggest complete disinvestment from certain practices.<sup>13</sup> In comparison, countries with private healthcare systems, such as the United States, have explored other options such as value-based insurance design. This design requires higher co-payments for services deemed to be low-value and lower co-payments for services of high-value.<sup>15</sup> This is a potentially valuable strategy for reducing low-value care, yet it is challenged by objective identification of low-value practices and, owing to this challenge, does not have complete support from the public.<sup>16</sup>

### ***1.2.2 Initiatives to reduce low-value care within clinical interactions***

The American *Choosing Wisely* campaign employed a novel approach to reducing low-value care by bypassing the policy level to directly target care providers and patients and encourage their involvement in reducing low-value care. Launched in 2012 by the American Board of Internal Medicine Foundation,<sup>17</sup> the campaign engages professional medical societies to develop lists of, “*Things Physicians and Patients Should Question,*”

which include tests and treatments that are unnecessary or potentially harmful within their medical discipline.<sup>18</sup> Choosing Wisely engages patients and the public by encouraging patients to question their physicians about the value of tests and treatments identified in the ‘do not do’ lists, thereby using the clinical encounter to generate discussion and prevent the use of low-value care. Brochures, posters, and advertisements are placed in hospitals and clinics to inform patients and encourage these conversations.<sup>18</sup> They have also partnered with a consumer organization, *Consumer Reports*, to disseminate their advertisements to a larger public audience. To date, the campaign has been implemented in 12 countries<sup>19</sup> including Canada in 2014.<sup>18</sup>

The Choosing Wisely campaign has also faced significant challenges. A recent commentary on the progress of the campaign noted that an emerging concern is how physicians can maintain professionalism and autonomy in decision making while engaging in the suggested discussions with patients.<sup>20</sup> It is unclear if patients share the same concern about how the campaign’s push to question providers on the value of care could influence the provider-patient relationship or their judgement of the provider’s professionalism. Additionally, a recent evaluation of seven clinical practices identified as being low-value by *Choosing Wisely* found that only two decreased after being incorporated in to their recommendations.<sup>21</sup> However, the multi-faceted nature of the campaign makes it challenging to discern which components (e.g., clinician engagement, patient engagement) are ineffective. This evidence suggests that additional strategies are required to promote reductions in the use of low-value care.

Considering that the identification and classification of low-value practices may not be sufficient to promote behavior change, researchers have begun developing targeted interventions to reduce specific low-value practices. Many of these interventions have been conducted on a smaller scale, such as within a province or single institution, and have employed various approaches to encourage behavior change. The province of Alberta, for example, developed a criterion-based form for Vitamin D testing requisitions. The form required physicians to identify the reason for testing Vitamin D levels, and testing would not be permitted for reasons that did not meet the evidence-based criteria. This approach resulted in a 92% decrease in test orders.<sup>22</sup> Other interventions have focused on directly educating care providers about the costs and potential risks associated with a low-value practice. An academic medical center in California used this approach to reduce unnecessary diagnostic imaging<sup>23</sup> and saw small reductions in the number of tests ordered. These interventions show promising results, yet it is unclear whether such interventions will lead to sustainable changes in clinical practice.

### ***1.2.3 Understanding the challenges associated with reducing low-value care***

Within the literature, multiple factors have been proposed to explain the current challenges associated with abandoning low-value care. For example, the amount and quality of evidence required for an established medical practice to be considered low-value is unclear,<sup>24,25</sup> especially when considered in the context of evidence that originally suggested the practice to be of high-value. In addition to challenges with insufficient evidence, providers have cited various reasons for continued administration of low-value

tests or treatments, such as meeting the expectations of patients<sup>26-28</sup> and avoiding malpractice.<sup>26,28,29</sup> The nature of illness may also impact the assessment of the value of a test or treatment. In an ethical analysis of the *Choosing Wisely* campaign, Blumenthal-Barby described a hypothetical example of a cancer patient who has not been responsive to previous treatment and is not eligible for experimental treatment in a clinical trial. In this situation, a treatment that has been placed on a *Choosing Wisely* ‘Do Not Do’ list, because it is unlikely to be effective, could be perceived as having value to this patient if there is even a small chance that it could be effective.<sup>30</sup> Furthermore, the label of ‘low-value’ may have different implications if the practice has been shown to be ineffective compared to potentially harmful.<sup>30</sup> Unpacking the challenges associated with reducing low-value care demonstrates that understanding the optimal process to reduce low-value care will require the involvement and input of all relevant stakeholders, including providers, administrators, policy makers, and members of the public.

### **1.3 The role of the public in reducing low-value care**

Members of the public are inherently involved in the issue of low-value care. However, they may have a limited awareness of the sheer number of low-value practices commonly used within healthcare and how their use could impact their physical, emotional, and social wellbeing. Care providers have cited patients as drivers of low-value care due to their demand for low-value practices. For these reasons, engaging patients to both help inform initiatives to reduce low-value care and provide them with the information and tools to understand low-value care may be an effective strategy.

### ***1.3.1 Members of the public are key stakeholders in the initiative to reduce low-value care***

Members of the public are stakeholders in the initiative to reduce low-value care through their dual role as both patients and funders of healthcare. As funders of healthcare, either directly or through taxation, members of the public should pay for tests and treatments that are both effective and cost-effective. As patients, they have the potential to receive a low-value test or treatment. The consequences that result from exposure to a low-value practice can impact patients physically (e.g., complications from harmful low-value practices),<sup>31-33</sup> socially (e.g., missing work to attend appointments for repeat testing),<sup>32</sup> and emotionally (e.g., anxiety associated with false positive test results).<sup>32</sup> In addition, these consequences can accumulate with the use of downstream services that result from the initial use of a low-value practice.<sup>32</sup> Patients have also been reported to be a driving force behind the perpetuated use of low-value services; care providers have cited reasons such as patient demand and fear of litigation as barriers to reducing low-value care.<sup>26-28</sup>

### ***1.3.2 The public's perception of low-value care***

Within the increasingly growing body of literature pertaining to low-value care there are a comparatively smaller number of studies that have explored the public's perception of the issue. In a 2017 survey of 784 Americans, Schlesinger and Grob asked an open-ended question to explore their understanding of low-value care. Roughly one third of respondents could not articulate a meaningful description. When respondents offered a description of low-value care, only 5.6% mentioned that both tests and treatments could be low-value and roughly 1% mentioned that low-value care is linked to the cost of

medical care.<sup>34</sup> Findings from a qualitative study have suggested that the public may also be unaware of the potential harms associated with low-value care. When semi-structured interviews were conducted with older American adults, nearly two-thirds of participants could not name any harms associated with common screening tests, yet nearly all could name benefits. Participants named several factors that influenced their decision to undergo a screening test, including their physician's recommendation, personal and family experience, and insurance coverage.<sup>35</sup> Within the context of the Canadian healthcare system, Silverstein et al. conducted a survey with older adults to assess their knowledge of low-value screening and treatment practices within primary care. The proportion of adults that demonstrated accurate knowledge ranged from 15%-62%, depending on the practice.<sup>36</sup>

Taken together, the findings from these studies suggest that members of the public have limited knowledge of what constitutes low-value care and the potential personal and societal consequences. However, the literature on this subject is scarce and the findings may not be representative of the general public. Two of the three aforementioned studies focused solely on older adults, and Schlesinger and Grob's sample was mostly comprised of participants above the age of 45. It therefore remains unclear how contextual factors, such as age and nature of the healthcare system (i.e., public vs. private), may influence the public's perception of low-value care.

### *1.3.3 Engaging the public in initiatives to reduce low-value care*

Experts within the field have suggested that informing the public about low-value care may be helpful in reducing its use. For example, patients who are knowledgeable about unnecessary tests and treatments may put less demand on providers to order a low-value test or administer a low-value treatment.<sup>37</sup> This aligns with care providers' perspectives on the barriers to reducing low-value care; care providers have identified that patients' lack of understanding of low-value care and potential dissatisfaction can make it difficult to refrain from ordering such tests or treatments.<sup>38</sup> Educating patients about low-value care may also provide an opportunity to engage them in medical decision making through discussion about the potential risks and benefits of a test or treatment.<sup>37</sup> However, providers have cited lack of time as a barrier to having these discussions during the clinical encounter.<sup>38,39</sup> This evidence suggests that providers feel as though educating patients about low-value care may be helpful, yet it is unclear how this patient engagement strategy would be implemented and how it would impact the use of low-value practices.

In addition to being informed about low-value care and the associated consequences, previous work has explored how the public may actively participate in de-adoption initiatives, such as identifying and prioritizing low-value practices. One such activity was undertaken by the Right Care Alliance,<sup>40</sup> in which they gathered ten clinicians and eleven patient advocates to co-create a list of ten practices that are overused or underused. Importantly, the authors noted a significant limitation – they reported that some patient advocates refrained from voting on certain practices because they felt the medical



terminology was unclear, and this may have led to a biased prioritization of low-value practices.<sup>41</sup> The Choosing Wisely Campaign has also reported that some medical societies have involved members of the public in the development of their 'Do Not Do' lists,<sup>42</sup> and Choosing Wisely Canada has recently announced the appointment of two Patient Advisors, however details of their role have not been described.<sup>43</sup> Experts within the field of low-value care have acknowledged the importance of public involvement, but stressed the importance of engaging with members of the public to explore their perspectives on how they should be involved.<sup>44</sup> Collectively, this evidence suggests that further research is required to better understand strategies for engaging patients in initiatives to reduce low-value care and how their engagement would impact the use of low-value practices.

#### **1.4 Rationale**

The perpetuated use of low-value care has implications for the sustainability and quality of healthcare. In spite of the development of local interventions, public campaigns, and initiatives introduced by governments and policymakers, many low-value practices are still regularly used. The need for a solution to this problem has sparked interest in the potential role of the public.

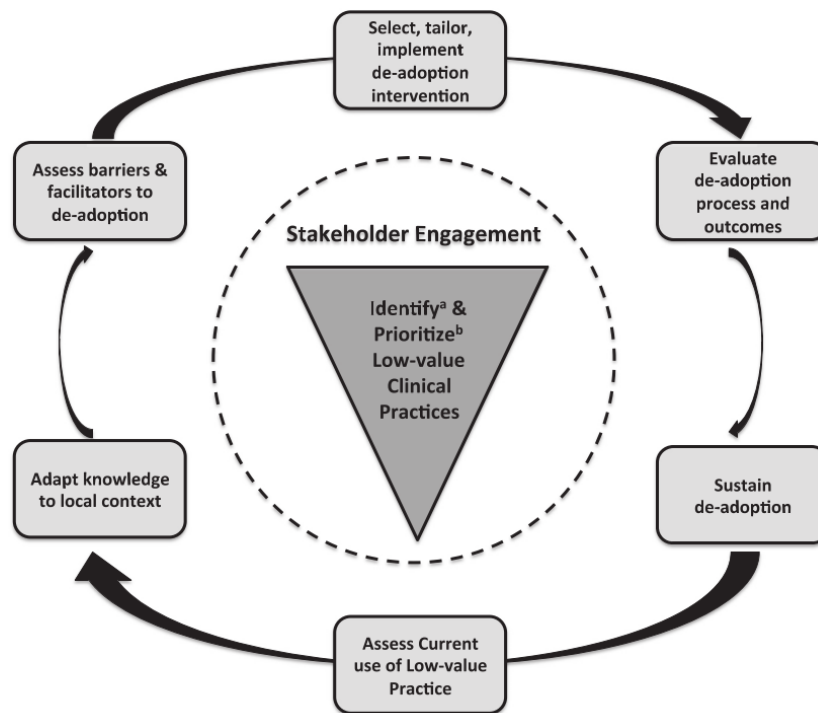
To date, the importance of public involvement in reducing low-value care has been acknowledged in editorials and reviews and manifested through initiatives, such as the Choosing Wisely campaign. However, the concepts of low-value care and public engagement are complex and understanding their interaction requires further

investigation. Specifically, discerning the role of the public in reducing low-value care requires further understanding of which stakeholders should engage the public, the strategies by which they may be engaged, and the impact of their involvement on the use of low-value practices.

The overall objective of the research completed as part of this thesis was to conduct a systematic and comprehensive synthesis of the literature to describe what is currently known about the role of the public in reducing low-value care. First, scoping review methodology was used to examine the peer-reviewed and grey literature and describe strategies for public involvement within the realm of clinical interactions, research, and healthcare policy and administration. Second, a systematic review and meta-analysis of randomized clinical trials and non-randomized intervention studies was conducted to estimate how patient-targeted interventions impact the use of low-value practices. Taken together, these studies will improve our understanding of the strategies for engaging the public in reducing low-value care and identify areas that require further research.

## 1.5 Conceptual Framework

This project will utilize the model of the process of de-adoption proposed by Niven et al (Figure 1.1) to conceptualize the process of reducing low-value care and map areas of public involvement. This model is comprised of seven phases, collectively providing a framework to guide the de-adoption of low-value practices.<sup>45</sup>



**Figure 1.1 Conceptual model for the process of de-adoption**

Based on findings from a scout search of the literature pertaining to low-value care, four phases of de-adoption have been identified as potentially relevant to public involvement: identify and prioritize low-value clinical practices; assess barriers and facilitators to de-adoption; select, tailor, implement de-adoption intervention; and evaluate de-adoption process and outcomes. Operational definitions for these four phases and relevant examples are outlined in Table 1.1.

**Table 1.1 Conceptual framework**

| <b>Phase of de-adoption*</b>                       | <b>Operational definition</b>  | <b>Example</b>   |
|--|--|--|
| Identify & prioritize low-value clinical practices | 1) The public's conceptual understanding of low-value care<br>2) The public's involvement in identifying or prioritizing low-value practices for de-adoption | 1) A survey asking members of the public to describe low-value care<br>2) Patient and provider co-creation of a priority list of practices for de-adoption |
| Assess barriers & facilitators to de-adoption      | The public's perception of barriers and facilitators to reducing low-value care  | Exploring patient perspectives on the demand for low-value care  |
| Select, tailor, implement de-adoption intervention | Public involvement in developing interventions to reduce low-value care  | Involving a patient representative in the design of an intervention to reduce a low-value practice   |
| Evaluate de-adoption process and outcomes          | The public's involvement in the evaluation of outcomes of an initiative to reduce low-value care   | Inclusion of patient-reported outcomes in an intervention to reduce the use of a low-value practice  |

\*Adopted from the conceptual model of the process of de-adoption developed by Niven et al<sup>45</sup>

## **1.6 Thesis structure**

This is a manuscript-based thesis containing two studies that have been completed as part of this thesis.

Chapter two is the scoping review manuscript that has been submitted to a journal for peer review. This scoping review examined what is known about the role of the public in reducing low-value care.

Chapter three is the systematic review and meta-analysis manuscript that has been submitted to journal for peer review. This systematic review examines patient-targeted interventions to reduce low-value care and the meta-analysis provides an estimate of how these interventions effect the number of patients who receive certain low-value practices.

Chapter four provides concluding comments by reviewing what is known about public involvement in reducing low-value care, highlighting strategies for public involvement and providing suggestions for future research.

**CHAPTER TWO: UNDERSTANDING THE ROLE OF THE PUBLIC IN  
REDUCING LOW-VALUE CARE: A SCOPING REVIEW**

## 2.1 Abstract

**Background:** Initiatives to reduce low-value care are rapidly growing, however it's not clear how members of the public, including patients and their caregivers, should be involved.

**Purpose:** To systematically examine literature describing the involvement of the public in initiatives to reduce low-value care.

**Data Sources:** MEDLINE, Embase, and CINAHL databases from inception to June 28, 2018; grey literature (CADTH Tool); reference lists of included articles; and expert consultation.

**Study Selection:** Citations were screened in duplicate and included if they referred to the public's perception and/or involvement in reducing low-value care.

**Data Extraction:** Extracted data pertained to study characteristics, low-value practice, clinical setting, and level of public involvement (e.g., patient-clinician interaction).

**Data Synthesis:** 151 citations were included in the final review, which were predominantly original research (n=99, 65%), published since 2008 (n=126, 83%), originating from North America (n=104, 69%). Most citations described engagement within the patient-clinician interaction (n=117, 78%) through strategies including shared decision-making (n=50) and patient-targeted education tools (n=36), with findings indicating improved patient satisfaction and decreased use of low-value care. Among citations examining stakeholder perspectives (n=8, 5%), there was consistent support for the utility of clinically-applied educational and shared decision-making tools and less consistent support for public involvement in policy decisions.

**Limitations:** 1) Restriction to English language may have led to omission of articles; 2) Mapping included studies to a conceptual framework is a subjective process; 3) Quality assessment of included articles was not conducted.

**Conclusions:** Use of patient-oriented educational materials and shared decision-making as tools to engage patients in efforts to reduce low-value care are common and associated with reductions in low-value care and improved patient satisfaction. This contrasts with inclusion of the public in low-value care policy decisions where tools to promote engagement are less well-developed and involvement not consistently viewed as valuable.

**Registration:** Open Science Framework (<https://osf.io/6fsxm>)



## 2.2 Introduction

The ongoing use of low-value healthcare practices, defined as medical tests or treatments that lack efficacy, are potentially harmful, or not cost effective, impedes the delivery of safe, efficient, and cost-effective healthcare.<sup>31</sup> Estimates suggest that unnecessary care in the United States costs upwards of \$210 billion dollars annually<sup>46</sup> and consumes resources that could be allocated to high-value, necessary care. On an individual level, receiving a low-value test or treatment can lead to physical, psychological, and financial consequences for patients and their caregivers.<sup>31-33</sup> Studies from Australia and the United States identified 156<sup>14</sup> and 146<sup>47</sup> low-value practices, respectively, and upwards of 600 ‘Do Not Do’ recommendations have been produced through the Choosing Wisely campaign.<sup>48</sup> However, this identification of low-value practices has not been followed by a commensurate reduction in their use.<sup>7,21,49</sup> This is likely influenced by a number of factors,<sup>50</sup> one of which may be stakeholder engagement.

Members of the public have been identified as important stakeholders within initiatives to reduce low-value care.<sup>25,37</sup> Their dual role in this process includes: 1) payment for healthcare services directly, or indirectly; and 2) recipients of healthcare. Thus, there are multiple opportunities for their inclusion in efforts to reduce low-value care. At its inception, the Choosing Wisely campaign recognized the patient-clinician interaction as an opportunity to reduce low-value care; they developed patient-targeted education materials with the goal of empowering patients to engage with their clinicians in a joint effort to avoid low-value care.<sup>42</sup> Patient and public representatives may also contribute to research activities aiming to reduce low-value care, as numerous patient-targeted

interventions continue to be developed and evaluated.<sup>51</sup> In addition, there has been a call for public involvement within healthcare policy and administration, with opportunities in health technology re-assessment<sup>52</sup> and health systems-level initiatives aiming to reduce low-value care.<sup>37,53</sup>

How patients and the public are optimally involved in initiatives to reduce low-value care has recently been highlighted as a deficiency in the science that underpins reducing low-value care.<sup>54</sup> While a number of reviews and editorials speak to public engagement,<sup>37,44,55,56</sup> there is a poor understanding of which organizations and stakeholders should be engaging the public, the extent to which the public should be involved, how public involvement impacts initiatives to reduce low-value care, and, importantly, how members of the public themselves wish to be involved. Therefore, we used scoping review methodology to systematically examine the literature to further understand current strategies for public involvement in reducing low-value care, determine what works and what does not work, and identify areas that require additional research. Scoping review methodology was selected as it provides the optimal approach to synthesizing and mapping evidence from a body of literature that is predicted to be heterogenous.<sup>57,58</sup>

## **2.3 Methods**

The methods for this scoping review were guided by the Joanna Briggs Institute Methodology for Scoping Reviews,<sup>57</sup> and the corresponding protocol was registered with Open Science Framework (<https://osf.io/6fsxm>). We utilized a conceptual framework to guide data charting of included citations (Table 2.1). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist was used to guide reporting of methods and findings.<sup>58</sup>

### ***2.3.1 Data Sources and Searches***

We searched MEDLINE, Embase, and CINAHL from inception to June 28, 2018. The search strategy (Table 2.2) was developed in consultation with a medical librarian and was peer reviewed by a second medical librarian using the Peer Review of Electronic Search Strategies (PRESS) Checklist.<sup>59</sup> Search terms included keywords and their synonyms relevant to three main concepts: low-value care (e.g., overuse, de-adoption, de-implementation); the public (e.g., citizens, patients); and public involvement (e.g., patient interaction, community participation). The database search was limited to the English language as much of the terminology pertaining to low-value care (e.g., Choosing Wisely, low-value, overuse, etc.) is language-specific and may not translate well across languages. Additional citations were identified by searching the grey literature using the Canadian Agency for Drugs and Technologies in Health (CADTH) tool<sup>60</sup> (Table 2.3), as well as reference lists of included articles, and consultation with experts in the field.

### **2.3.2 Study Selection**

Citations were eligible for inclusion if they were written in English and referred to the public's perception of and/or involvement in reducing low-value care. 'Public' included patients, caregivers, and citizens. Low-value care was defined according to that proposed by Elshaug *et al* as a medical test or treatment “in which evidence suggests it confers no or very little benefit for patients, or risk of harm exceeds probable benefit, or, more broadly, the added costs of the intervention do not provide proportional added benefit.”<sup>37</sup> Citations were excluded if they predominantly focused on the role of clinicians in reducing low-value care.

Citations identified through the electronic search were screened independently in two steps by two investigators (EES and CD) using Endnote (Clarivate Analytics, Philadelphia, United States). Prior to any screening, the citation screening form was pilot tested using a random sample of 50 citations. The form was refined until agreement was consistent as denoted by a kappa statistic ( $k$ ) > 0.8. During level one screening, both investigators examined the title and abstract of each citation to determine its eligibility for full text review. Citations that met the eligibility criteria or were unclear proceeded to level 2 screening, where both investigators reviewed the full-text of each citation to determine eligibility. If the citation was excluded, the precise reason for exclusion was recorded. Any disagreements were resolved through discussion, or consultation with a third reviewer (DJN). Agreement during both phases of screening was quantified using the kappa statistic.<sup>61</sup>

### ***2.3.3 Data Extraction and Quality Assessment***

All data charting was conducted independently by two investigators (EES and CD) using DistillerSR (Evidence Partners, Ottawa, Canada). Prior to full data extraction, our data extraction form was pilot tested using six randomly-selected citations. Extracted data broadly pertained to study characteristics (e.g., year, country, study design), the low-value practice of interest (i.e., diagnostic test or therapeutic treatment), and the clinical setting (e.g., emergency department, primary care). We also extracted data that reported *where* and *how* the public was involved in reducing low-value care. We coded the level of patient engagement as a ‘patient-clinician interaction’ (i.e., strategies for public involvement that were employed during a clinical interaction), ‘research’ (i.e., involving the public in conducting or evaluating research aiming to reduce low-value care), or ‘policy/administration’ (i.e., involving the public in policy or administration level initiatives to reduce low-value care).

### ***2.3.4 Data Synthesis and Analysis***

Included citations were mapped to a conceptual framework to describe how the public contributed to reducing low-value care (Table 2.1). The framework was developed by determining which components of Niven *et al*’s framework for facilitating de-adoption were most relevant to public involvement.<sup>45</sup> Included citations that described or evaluated a strategy for public involvement were assessed to determine whether they indicated support or did not support the given strategy. For original research citations (e.g., randomized clinical trial), a statistically significant reduction in the targeted low-value aspect of care defined support for the given public involvement strategy. For non-original

research citations, (e.g., editorial) support was indicated by a generally positive discussion of the given strategy. All data was summarized by numerical counts and percentages as appropriate using Stata statistical software (StataCorp, Texas, USA).

## **2.4 Results**

### ***2.4.1 Citation Selection***

The search strategy returned 7,947 citations from electronic databases and 26 citations from the grey literature (Figure 2.1). After removing duplicates, 5,459 unique citations were screened for inclusion from which 250 proceeded to full text screening, and 124 were included in the review. The most common reasons for excluding citations during full-text screening were lack of focus on reducing a low-value practice and focus on other stakeholders such as physicians. Screening reference lists of included citations and consultation with experts identified an additional 27 citations. Combined with the 124 citations included after electronic database and grey literature review, 151 citations were included in the final review.

### ***2.4.2 Study Characteristics and Classification within Conceptual Frameworks***

A detailed bibliography of included citations is available in Table 2.4 with an overall summary of relevant characteristics presented in Table 2.5. Included citations were predominantly original research (n=99, 65%) from North America (n=104, 69%). Most citations were published in the last ten years (n=126, 83%), with a large increase following 2012/2013 (Figure 2.2). Among citations reporting original research, studies were commonly observational cohort studies (n=33, 22%), qualitative designs (n=18,

12%), or randomized clinical trials (n =16, 11%). Other article types included narrative reviews (n=21, 14%), commentaries (n=19, 13%), and news items (n=10, 7%). Most citations spoke of low-value care in a general sense (n=65, 43%), with 31% (n=47) focusing on low-value treatments, and 19% (n=29) on low-value tests. Among citations that reported reducing low-value care within a specific clinical setting, the most common location was within inpatient hospital departments (n=27, 18%), followed by primary care practices (n=26, 17%) and emergency departments (n=16, 11%).

#### ***2.4.3 Inclusion of the Public in Strategies that Aim to Reduce Low-value Care***

Strategies for public involvement in reducing low-value care were described or tested in 143 citations. Of these, 91 (64%) were original research and 52 (36%) were non-original research. Most citations referred to a strategy that included the public within the setting of a patient-clinician interaction (n=111, 78%), with less to do with policy/administrative decision-making (n=25, 17%) or low-value care research (n=23, 16%) (Figure 2.3).

Examples of common strategies for public involvement across all three levels of engagement and within their respective components of the conceptual framework for reducing low-value care are displayed in Figure 2.4. Within the patient-clinician interaction, the focus was on helping patients identify low-value practices through the dissemination of educational materials and approaches such as shared decision-making (n=113, 75%; individual study details in Table 2.4). As depicted in Figure 2.5, the significance of outcomes and/or discussion within these citations mostly indicated support for these strategies. Of the 50 studies that focused on shared decision-making, 45 indicated support (90%). In studies that tested a shared decision-making approach, many

reported improved patient knowledge and satisfaction with their decision-making process. In three studies (6%), it was unclear whether the support was positive or negative. Two studies (4%) did not support shared decision-making as a strategy for public engagement, however these studies were both non-original research (news item and narrative review). Of the 36 citations that discussed or evaluated providing educational materials as a strategy for public involvement, three (8%) did not indicate support for the strategy. Of the articles that did indicate support, 23 (64%) were original research and 10 (28%) were non-original research citations (Figure 2.5).

At the level of policy and administration, 25 (17%) citations referenced public involvement in prioritizing low-value practices, such as through the involvement of citizens in disinvestment decisions. Of these studies, most were original research (n=17, 68%) and involved the public through surveys, focus groups, and community engagement events to solicit their perspective about de-adoption decisions. Fewer studies involved the public in assessing barriers and facilitators to reducing a low-value practice (n=1, 1%) or in helping to develop an intervention to reduce a low-value practice (n=3, 2%) (Figure 2.3).

Within research activities, the public was engaged within all steps in our conceptual framework, from prioritizing low-value practices (n=21, 14%) (e.g., involving patients in developing a Choosing Wisely list) to evaluating outcomes in interventions that aimed to reduce their use (n=15, 10%) (e.g., evaluating patient satisfaction with care and decision making process) (Figure 2.3). Here, studies commonly engaged the public in the



development of educational materials or other patient-targeted tools used within interventions so that they would be clear and effective for patient use.

#### ***2.4.4 Stakeholder Perceptions Regarding Public Engagement in Reducing Low-value Care***

Eight citations examined stakeholder perspectives regarding public involvement in reducing low-value care (Table 2.6). Of these, five engaged demand-side stakeholders, including patients and community members. The most commonly discussed strategy for public involvement was shared decision-making with care providers. Support for this strategy was reported as positive in all four studies. One study from the United Kingdom asked community members if they thought citizens should be involved in disinvestment decision making (i.e., the decision withdraw resources from a given medical practice<sup>13</sup>) within the NHS, and the responses were overall negative.<sup>62</sup> In this study, community members felt as though citizens may not have the knowledge and expertise required to participate in disinvestment decision making.<sup>62</sup> Another study from the United Kingdom posed the same question to healthcare administrators, and found that while they were supportive of involving citizens, there were concerns about how to achieve meaningful engagement and the potential challenges that may arise.<sup>63</sup> Among the studies that engaged supply-side stakeholders, including physicians, nurses, and administrators, suggestions for public involvement that were supported included providing education about low-value practices<sup>64,65</sup> and shared decision-making between care providers.<sup>64</sup>

## 2.5 Discussion

We identified 151 citations that described, evaluated, or suggested a strategy for public involvement in reducing low-value care. The majority of included citations were published following inception of Choosing Wisely in 2012 (Figure 2.2).<sup>48</sup> Studies suggest that public involvement in reducing low-value care take place across three levels: 1) patient-clinician interactions; 2) policy/administrative decision-making; and 3) research. Most citations focused on the patient-clinician interaction, with a smaller number focused on public involvement in policy initiatives, or low-value care research. With regard to the patient-clinician interaction, commonly described or tested strategies included patient-targeted education and shared decision-making, both of which demonstrated utility in reducing low-value care and were supported by effected stakeholders. Among citations that described or tested strategies for public involvement at the policy/administrative level, the most common strategy for public involvement was participation in prioritizing a practice for de-adoption. However, the perceived utility of public involvement was questioned by the public and healthcare administrators. Within low-value care research, examples of public involvement included developing patient-targeted tools to be used in interventions and involving public representatives in projects to reduce low-value care. Given the breadth of the literature examined, the importance of patient and public inclusion as stakeholders in implementation science initiatives,<sup>66</sup> and resources dedicated to reducing low-value care,<sup>56</sup> the findings of this study have implications for current and future initiatives that seek to reduce low-value care.

Arguably the most important interaction in healthcare is that between the patient and clinician. Therefore, it's no surprise that this was the most commonly described context for engaging the public in reducing low-value care. Given that patient-demand is a frequently cited barrier to reducing use of care deemed to be low-value,<sup>26-28</sup> tools that inform patients and their caregivers at the point-of-care about the lack of utility of certain tests or treatments offers potential to reduce the overuse of low-value care. With regard to behavioural change interventions,<sup>67</sup> education materials such as posters and pamphlets developed through the Choosing Wisely campaign are considered entry level tools whose purpose is to promote change through increasing knowledge and awareness regarding common low-value practices. The two studies that evaluated Choosing Wisely educational materials found them to improve general awareness and promote conversations about low-value practices.<sup>36,68</sup> Additional strategies targeting the patient-clinician interaction included participation in shared decision-making<sup>69</sup> and the use of decision aids to help patients make informed decisions about low-value practices.<sup>70</sup> Compared to informative posters and pamphlets that attempt to passively change behaviour, shared decision-making and the use of decision aids are considered higher-level behavioural change interventions as they are meant to guide choice.<sup>67</sup> In shared decision-making, patients and clinicians discuss the best evidence surrounding the practice, thereby enabling patients to develop informed preferences.<sup>71</sup> Decision aids can be incorporated into this approach as a tool to facilitate the transfer of information. For example, clinicians may utilize a decision aid to inform a patient in the emergency department about the potential risks and lack of efficacy of cardiac stress testing, and facilitate a discussion about the patient's preference for receiving the test.<sup>72</sup> Included

studies evaluating decision-making tools generally reported an associated reduction in use of the targeted low-value practices, as well as improvements in other aspects of the patient experience (e.g., decisional conflict, patient trust in clinician). Moreover, the small number of studies that examined the perspectives of patients, caregivers, and clinicians regarding the use of such behavioural change tools reported positive findings that further support their use. From the patient perspective, engaging in decision making with clinicians can help foster a more trusting relationship, which in turn helps patients accept evidence-based recommendations.<sup>73,74</sup> This is consistent with findings from a systematic review evaluating the impact of interventions using decision aids, wherein decision aids were found to reduce a patient's decisional conflict and improve communication with their clinicians.<sup>75</sup> In addition, these strategies could potentially imprint an awareness of low-value care that may be applied by patients to their future healthcare experiences. Additional research is required to further understand how the utility of these strategies is influenced by factors such as the nature of the low-value practice (e.g., unnecessary vs. potentially harmful) or the clinical setting (e.g., primary care clinic vs. intensive care unit).

Our study identified two additional opportunities for public involvement in reducing low-value care – policy/administrative decision-making, and research. At the policy level, members of the public have most commonly been involved in prioritizing low-value practices for reduction or discontinuation through activities such as community juries and citizen's councils. For example, Australia has hosted community juries to examine the public's perception about disinvestment for assisted reproductive technologies<sup>76</sup> and

folate pathology testing.<sup>77</sup> In many of these studies, the rationale for involving the public was to gain insight and perspectives to supplement those from administrators and policy makers.<sup>78,79</sup> However, in contrast to the patient-clinician interaction where stakeholders unanimously agreed on the value of patient-targeted tools to reduce low-value care, stakeholders are uncertain about whether members of the public should be involved in policy-making and healthcare administration decisions. Members of the public indicated that they may not have the knowledge or expertise required to contribute to discussion and decision-making,<sup>62</sup> whereas administrators are interested in engaging members of the public but acknowledge the logistical difficulties with achieving meaningful engagement.<sup>63</sup> Recognizing that opportunities for public involvement in policy may be shaped by the country, level of government or institution, and nature of the low-value practice in question, this is an aspect of reducing low-value care that definitely requires additional research. Within low-value care research, members of the public have contributed to the assessment of barriers and facilitators for reducing low-value care, developing and testing tools and interventions for reducing low-value care, and evaluating outcomes of interventions to reduce low-value care through the reporting of important patient-centred outcomes. Studies have acknowledged the importance of involving patients in research, as they can offer meaningful insight and increase the effectiveness of patient-targeted tools and interventions.<sup>80,81</sup> However, since only a small number of studies engaged the public through research it is challenging to make conclusions about the impact of public involvement in low-value care research. Additionally, none of the studies investigating stakeholder perspectives examined perspectives about involving patients as partners in low-value care research. Research

that aims to explore how to successfully reduce low-value care will inform the implementation of initiatives at the administrative and policy level, which have the potential to create change on the largest scale. For this reason, understanding how to effectively engage patients and the public early on in the process, through strategies supported by all stakeholders, is imperative to the development of successful initiatives to reduce low-value care.

The findings of this scoping review must be interpreted within the context of its limitations. First, while our search strategy was peer reviewed and designed to have high sensitivity, restriction to English language may have led to the omission of relevant citations. This was done because much of the terminology pertaining to low-value care (e.g., Choosing Wisely, low-value, overuse, etc.) is language-specific and may not translate well across languages, which, when combined with the fact that our final review included 151 citations, make it unlikely that any missed non-English language citation would significantly alter the main results. Second, mapping included studies to our conceptual framework was a potentially subjective process at risk for misclassification bias. To minimize this risk of bias, all studies were classified in duplicate, agreement checked, and disagreements resolved by consensus or consultation with a third reviewer (DJN). Finally, as this was a scoping review, we did not assess the quality of included articles. As described in the recently published PRISMA extension for scoping reviews, article quality assessment is not a typical feature of scoping reviews unless it aligns with the objectives of the review and is practical to complete.<sup>58</sup> The number and heterogeneity

of included citations precluded any meaningful assessment of quality of included articles, nor would such data have materially changed the main results of the study.

In conclusion, we identified a large body of literature examining public involvement in reducing low-value care. Levels of engagement commonly include patient-clinician interactions, participation in policy/administrative decision-making, and research. Current literature suggests that engaging patients and their caregivers in initiatives to reduce low-value care through point-of-care strategies that include patient-targeted educational materials and shared decision-making tools improve patient awareness of low-value care, decrease requests for low-value tests and treatments, and improve patient satisfaction. In contrast, there is less certainty regarding public involvement in policy-making and administrative decisions related to low-value care. As initiatives to reduce low-value care evolve, additional research should examine stakeholder perspectives and quantify the impact of public involvement on reducing low-value care.

**Table 2.1 Conceptual framework for data charting**

| <b>Phase of de-adoption*</b>                       | <b>Operational definition</b>  | <b>Example</b>   |
|--|--|--|
| Identify & prioritize low-value clinical practices | 1) The public’s conceptual understanding of low-value care<br>2) The public’s involvement in identifying or prioritizing low-value practices for de-adoption | 1) A survey asking members of the public to describe low-value care<br>2) Patient and provider co-creation of a priority list of practices for de-adoption |
| Assess barriers & facilitators to de-adoption      | The public’s perception of barriers and facilitators to reducing low-value care  | Exploring patient perspectives on the demand for low-value care  |
| Select, tailor, implement de-adoption intervention | Public involvement in developing interventions to reduce low-value care  | Involving a patient representative in the design of an intervention to reduce a low-value practice   |
| Evaluate de-adoption process and outcomes          | The public’s involvement in the evaluation of outcomes of an initiative to reduce low-value care   | Inclusion of patient-reported outcomes in an intervention to reduce the use of a low-value practice  |

\*Adopted from the conceptual model of the process of de-adoption developed by Niven et al<sup>45</sup>



**Table 2.2 MEDLINE (Ovid) Search Strategy**

| #  | Searches  |
|----|---|
| 1  | health services misuse/ or medical overuse/   |
| 2  | Unnecessary Procedures/   |
| 3  | ((misuse* or overuse* or unnecessary or ineffective or overtreat* or overdiagnos* or overutilis* or overutiliz* or low-value or waste*) adj5 (health or healthcare or care or procedure* or intervention* or test* or treatment*)).tw,kf.   |
| 4  | ((abandon* or contradict* or refute* or refuting or reassess* or re-assess* or obsole* or revers* or delist* or de-list* or disinvest* or dis-invest* or discontinu* or dis-contin* or decommission* or de-commission* or deadopt* or de-adopt* or de-implement* or deimplement*) adj5 (medical or health or healthcare or policy or procedure* or intervention*)).tw,kf. |
| 5  | 1 or 2 or 3 or 4  |
| 6  | patient participation/ or community participation/  |
| 7  | patient satisfaction/ or patient preference/  |
| 8  | ((patient* or family* or families or public or citizen* or consumer*) adj5 (perception* or engag* or involv* or participat* or decision* or interaction* or role* or aware* or conversation* or responsibilit* or discuss*)).tw,kf.   |
| 9  | 6 or 7 or 8   |
| 10 | 5 and 9   |
| 11 | choosing wisely.mp.   |
| 12 | 10 or 11  |
| 13 | Limit 12 to English language  |

**Table 2.3 Information sources accessed through the Canadian Agency for Drugs and Technologies in Health (CADTH) Grey Literature Search Tool**

| <b>Information Source</b>  | <b>Website</b>  |
|--|---|
| The Alberta College of Family Physicians (ACFP). Tools for Practice            | <a href="http://acfp.ca/WhatWeDo/ToolsforPractice.aspx">http://acfp.ca/WhatWeDo/ToolsforPractice.aspx</a>   |
| Canadian Agency for Drugs and Technologies in Health (CADTH)                   | <a href="https://www.cadth.ca/search?keywords">https://www.cadth.ca/search?keywords</a>   |
| Health Quality Council of Alberta (HQCA). Completed Reviews                    | <a href="http://hqca.ca/studies-and-reviews/completed-reviews/">http://hqca.ca/studies-and-reviews/completed-reviews/</a>                                       |
| Health Quality Ontario (HQO). Publications and OHTAC Recommendations.          | <a href="https://www.hqontario.ca/evidence/publications-and-ohtac-recommendations">https://www.hqontario.ca/evidence/publications-and-ohtac-recommendations</a> |
| Ottawa Hospital Research Institute (OHRI). Knowledge Synthesis Group           | <a href="http://www.ohri.ca/ksgroup/publications.asp">http://www.ohri.ca/ksgroup/publications.asp</a>   |
| University of British Columbia. Centre for Health Services and Policy Research | <a href="http://chspr.ubc.ca/pubs/pub-search">http://chspr.ubc.ca/pubs/pub-search</a>   |
| International Network of Agencies for Health Technology Assessment (INAHTA)    | <a href="http://www.inahta.org/publications">http://www.inahta.org/publications</a>   |

| <b>Information Source</b>  | <b>Website</b>   |
|--|--|
| Australian Government Department of Health and Ageing. Medical Services Advisory Committee (MSAC). Completed Assessments and Reviews | <a href="http://www.msac.gov.au/internet/msac/publishing.nsf/Content/completed-assessments">http://www.msac.gov.au/internet/msac/publishing.nsf/Content/completed-assessments</a>  |
| Monash Health. Centre for Clinical Effectiveness (CCE). Current Evidence Reviews   | <a href="http://www.monashhealth.org/page/Current">http://www.monashhealth.org/page/Current</a>  |
| Institute of Technology Assessment (ITA).  | <a href="http://www.oeaw.ac.at/ita/en/projects">http://www.oeaw.ac.at/ita/en/projects</a>  |
| Kenniscentrum voor de Gezondheidszorg / Le Centre d'expertise des soins de santé. Belgian Healthcare Knowledge Centre (KCE)          | <a href="https://kce.fgov.be/search/apachesolr_search/?filters=type:biblio%20ss_biblio_secondary_title:" kce%20reports"&amp;retain-filters='1"'>https://kce.fgov.be/search/apachesolr_search/?filters=type:biblio%20ss_biblio_secondary_title:"KCE%20Reports"&amp;retain-filters=1</a> |
| Health Information and Quality Authority. Health Technology Assessments  | <a href="http://www.hiqa.ie/healthcare/health-technology-assessment/assessments">http://www.hiqa.ie/healthcare/health-technology-assessment/assessments</a>  |
| Swedish Council on Health Technology Assessment (SBU).   | <a href="http://www.sbu.se/en/">http://www.sbu.se/en/</a>  |

| <b>Information Source</b>   | <b>Website</b>  |
|---|---|
| Healthcare Improvement Scotland   | <a href="http://www.healthcareimprovementscotland.org">http://www.healthcareimprovementscotland.org</a>   |
| National Institute for Health and Care Excellence (NICE).   | <a href="http://www.nice.org.uk/">http://www.nice.org.uk/</a>   |
| National Institute for Health and Care Excellence (NICE). Advice List. Published evidence summaries | <a href="http://www.nice.org.uk/advice?type=esnm">http://www.nice.org.uk/advice?type=esnm</a>   |
| National Health Service UK (NHS). NHS England   | <a href="http://www.england.nhs.uk/">http://www.england.nhs.uk/</a>   |
| Agency for Healthcare Research and Quality  | <a href="https://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/">https://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/</a> |
| Blue Cross and Blue Shield Association. Technology Evaluation Center (TEC)                          | <a href="http://www.bcbs.com/blueresources/tec/topic.html">http://www.bcbs.com/blueresources/tec/topic.html</a>   |
| California Technology Assessment Forum (CTAF). Assessments  | <a href="http://www.ctaf.org/reports">http://www.ctaf.org/reports</a>   |
| Institute for Clinical and Economic Review (ICER).  | <a href="http://www.icer-review.org/index.php/Table/Appraisals">http://www.icer-review.org/index.php/Table/Appraisals</a>   |

| <b>Information Source</b>  | <b>Website</b>  |
|--|---|
| Washington State Health Care Authority (HCA). Health Technology Assessment Findings  | <a href="http://www.hca.wa.gov/hta/Pages/Forms/HTA_Findings.aspx">http://www.hca.wa.gov/hta/Pages/Forms/HTA_Findings.aspx</a>               |
| Toronto Health Economics and Technology Assessment Collaborative (THETA). THETA Publications and Knowledge Translation to Policy (KT) Activities | <a href="http://theta.utoronto.ca/content.php?pid=41861&amp;sid=3372336">http://theta.utoronto.ca/content.php?pid=41861&amp;sid=3372336</a> |
| Alberta Medical Association. Towards Optimized Practice (TOP)  | <a href="http://www.topalbertadoctors.org/cpgs.php?sid=1">http://www.topalbertadoctors.org/cpgs.php?sid=1</a>                               |
| Winnipeg Regional Health Authority (WRHA). Evidence Informed Practice Tools  | <a href="http://www.wrha.mb.ca/professionals/ebpt">http://www.wrha.mb.ca/professionals/ebpt</a>   |
| <a href="http://www.bpac.org.nz/Default.aspx">http://www.bpac.org.nz/Default.aspx</a>  | <a href="http://www.bpac.org.nz/Default.aspx">http://www.bpac.org.nz/Default.aspx</a>   |
| McMaster University, McMaster Health Forum. Health Systems Evidence  | <a href="http://www.healthsystemsevidence.org">http://www.healthsystemsevidence.org</a>   |
| Google   | <a href="http://www.google.com">http://www.google.com</a>   |
| Google Scholar   | <a href="http://scholar.google.ca">http://scholar.google.ca</a>   |

| <b>Information Source</b>  | <b>Website</b>  |
|--|---|
| Canadian Agency for Drugs and Technologies in Health (CADTH). Rx for Change. | <a href="https://www.cadth.ca/resources/rx-for-change/database/browse">https://www.cadth.ca/resources/rx-for-change/database/browse</a> |
| Canadian Nurses Association (CAN). Download/Buy                              | <a href="https://www.cna-aiic.ca/en/download-buy">https://www.cna-aiic.ca/en/download-buy</a>   |
| Registered Nurses' Association of Ontario (RNAO). Publications & Resources   | <a href="http://rnao.ca/resources">http://rnao.ca/resources</a>   |

**Table 2.4 Characteristics of citations included in the review (n=151)**

| <b>Author</b>  | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|--|-------------|--------------------------|-------------------------------------|---|-------------------------|--|
| <b>Studies that aimed to examine stakeholder perspectives about how the public should be involved in reducing low-value care</b> |             |                          |                                     |   |                         |  |
| <i>Level of public involvement: Patient-clinician interaction</i>  |             |                          |                                     |   |                         |  |
| Kanzaria <sup>64</sup>   | 2015        | United States of America | Cross-sectional                     | Advanced diagnostic imaging   | Emergency Department    | Emergency physicians perceived education of patient and families and involving patients in shared decision making for diagnostic testing for low probability outcomes. |
| Kullgren <sup>82</sup>   | 2018        | United States of America | Qualitative interviews/focus groups | Medications (other than metformin) to achieve a hemoglobin A1c below 7.5%, benzodiazepines or other sedative-hypnotics for insomnia, agitation or delirium, routine PSA-based screening for prostate cancer | Primary Care            | Patients want personalized decisions that are informed by the benefits and potential risks about following recommendations to reduce low-value-care                    |

| <b>Author</b>            | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>                | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|--------------------------|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Linsky <sup>73</sup>     | 2014        | United States of America | Qualitative interviews/focus groups | Unnecessary medications                  | Primary Care            | Patients are willing to discontinue unnecessary medications but stressed the importance of having a strong patient-provider relationship and engaging in shared decision making |
| Rohrbacher <sup>83</sup> | 2007        | Germany                  | Cross-sectional                     | Low-value care in general                | Emergency Department    | Patients want to discuss their preferences and personal experiences with their physician to arrive at the most evidence-based decision  |
| Scales <sup>65</sup>     | 2017        | United States of America | Cross-sectional                     | Unnecessary antibiotics in nursing homes | Long term care          | Educating the nursing home residents and their families about why it is unnecessary to prescribe antibiotics  |



| <b>Author</b>  | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>                        | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|--|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Schoenborn <sup>74</sup>   | 2017        | United States of America | Qualitative interviews/focus groups | Cancer screening when life expectancy is limited | Outpatient screening    | Interviewed patients about how they want to be involved in discussing stopping cancer screening - patients value a trusting relationship with their physician and want to incorporate health status into the discussion about screening cessation |
| <b><i>Level of public involvement: Healthcare administration and policy</i></b>                        |             |                          |                                     |  |                         |   |
| Daniels <sup>63</sup>  | 2018        | United Kingdom           | Mixed methods                       | Low-value care in general                        | Not specified           | Involving citizens in disinvestment decisions   |
| Hislop <sup>84</sup>   | 2011        | United Kingdom           | Qualitative interviews/focus groups | Low-value care in general                        | Not specified           | Taxpayers lack required knowledge and patients lack required impartiality to be heavily involved in national policy-making on disinvestment   |
| <b>Studies that described or tested a strategy for involving the public in reducing low-value care</b> |             |                          |                                     |  |                         |   |
| <b><i>Level of public involvement: Patient-clinician interaction</i></b>                               |             |                          |                                     |  |                         |   |

| <b>Author</b>          | <b>Year</b> | <b>Country</b> | <b>Study Design</b>         | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|------------------------|-------------|----------------|-----------------------------|---|-------------------------|---|
| Aggarwal <sup>85</sup> | 2014        | United Kingdom | Narrative review            | Low-value cancer treatment including imaging, radiation, drugs  | Hospital                | User charges to nudge patients away from low-value services   |
| Alber <sup>86</sup>    | 2017        | Germany        | Qualitative analysis        | Low-value care in general   | Primary care            | Educating patients on evidence, advantages of a wait and see approach, importance of health-conscious behaviour, price/cost transparency                  |
| Allam <sup>87</sup>    | 2015        | Switzerland    | Randomized controlled trial | Healthcare over utilization in general and prescription medication overuse for patients with rheumatoid arthritis | Not specified           | Online social support to increase knowledge and empower rheumatoid arthritis patients, improve their healthcare utilization and reduce medication overuse |

| <b>Author</b>          | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>       | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|------------------------|-------------|--------------------------|---------------------|---------------------------------|-------------------------|---|
| Almoosa <sup>88</sup>  | 2010        | United States of America | Quality Improvement | Low-value care in general       | Hospital                | Multidisciplinary family meetings to discuss patient's prognosis, family expectations and develop a care plan with the goal of reducing the use of futile treatments prior to death |
| Anstey <sup>89</sup>   | 2014        | United States of America | Framework           | Low-value care in general       | Hospital                | Treatment decisions should take patients' preferences into account to avoid overutilization of care the patient does not desire   |
| Ashe <sup>90</sup>     | 2006        | United States of America | Case-control        | Antibiotics                     | Primary Care            | Public education in the form of a waiting room poster   |
| Bansback <sup>68</sup> | 2016        | Canada                   | Cohort              | Imaging tests for low back pain | Emergency Department    | Choosing Wisely pamphlet to improve knowledge and intentions surrounding imaging tests for low back pain  |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|---------------------------|-------------|--------------------------|---------------------|---------------------------|-------------------------|--|
| Bezin <sup>91</sup>       | 2015        | France                   | Cohort              | Statins                   | Not specified           | Public discussion and media coverage on appropriate use of statins   |
| Bodenheimer <sup>92</sup> | 2005        | United States of America | Narrative review    | Low-value care in general | Not specified           | Shared decision making to help discuss available options and their consequences, and bring evidence-based knowledge to the point of care       |
| Bolt <sup>93</sup>        | 2016        | Netherlands              | Mixed methods       | Low-value care in general | Not specified           | Assessed patient and family perceptions of inappropriate care at the end of life, including over treatment or prolonging unnecessary treatment |
| Borasio <sup>94</sup>     | 2016        | Switzerland              | Narrative review    | Low-value care in general | Hospital                | Advanced care planning to discuss patient goals and preferences to avoid inappropriate or unnecessary procedures at the end of life            |

| <b>Author</b>          | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|------------------------|-------------|--------------------------|---|---------------------------|-------------------------|--|
| Born <sup>42</sup>     | 2017        | Canada                   | Editorial/commentary/letter-to-the-editor | Low-value care in general | Not specified           | Involving patient and public representatives to incorporate their perspectives into Choosing Wisely recommendations; Media campaigns providing the public with information about overuse; Shared decision-making with providers to make informed choices about their treatment plans |
| Brownlee <sup>55</sup> | 2016        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general | Not specified           | Use of shared decision-making tools, advanced care planning and public involvement in decision making and deliberation as a part of healthcare cost control and planning   |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|---|---------------------------|-------------------------|--|
| Buist <sup>38</sup>   | 2016        | United States of America | Cross-sectional                           | Low-value care in general | Primary Care            | Specific handouts to give to patients explaining why a certain test is or is not indicated and the risks and benefits; Public awareness campaign to raise the profile of the importance of reducing low-value care |
| Burgess <sup>95</sup> | 1989        | Canada                   | Narrative review                          | Low-value care in general | Not specified           | Patients should be educated about the costs, risks and benefits of medical treatments and should participate in medical decisions  |
| Burns <sup>96</sup>   | 2014        | United States of America | Narrative review                          | Low-value care in general | Not specified           | Create financial disincentives for commonly overused services  |
| Chernew <sup>97</sup> | 2007        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general | Not specified           | Patients take on more cost sharing for low-value services  |

| <b>Author</b>        | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|----------------------|-------------|--------------------------|---|---------------------------|-------------------------|--|
| Colla <sup>51</sup>  | 2017        | United States of America | Systematic review                         | Low-value care in general | Not specified           | Cost-sharing to shift cost of low-value care towards patients; direct patient education to inform them about low-value care; shared decision making; provider report cards so that they choose a high value provider |
| Colla <sup>98</sup>  | 2014        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general | Not specified           | Patient education to support patients in making informed decision based on service value through structured shared decision making/decision aids; patient cost sharing or value-based insurance design               |
| Cooper <sup>99</sup> | 2015        | United States of America | Framework                                 | Low-value care in general | Hospital                | Shared decision making to prevent overuse in surgeries   |

| <b>Author</b>           | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-------------------------|-------------|--------------------------|---|---|-------------------------|--|
| Dollman <sup>100</sup>  | 2005        | Australia                | Before-and-after                          | Antibiotic use for upper respiratory tract infections, sinusitis and otitis media | Primary Care            | Pamphlets highlighting risks and benefits of antibiotic use for URTIs distributed to general practices, pharmacies, hospitals, schools, childcare centers and clubs; articles in the local community paper |
| Engineer <sup>101</sup> | 2018        | United States of America | Pilot study                               | Computed tomography for mild head injury in the Emergency Department              | Emergency Department    | A clinical decision support tool that involved a structured discussion between providers and patients  |
| Fendrick <sup>15</sup>  | 2010        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general   | Not specified           | Patients take on more of the cost sharing for low-value services   |



| <b>Author</b>            | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>         | <b>Low-value practice</b>                       | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|--------------------------|-------------|--------------------------|-----------------------------|---|-------------------------|--|
| Filipetto <sup>102</sup> | 2008        | United States of America | Cross-sectional             | Antibiotic use for respiratory and common colds | Primary Care            | Determine patient knowledge and perception of upper respiratory tract infections and appropriateness of antibiotic treatment; Assess patient satisfaction on physician decision to prescribe/not prescribe antibiotics   |
| Francis <sup>103</sup>   | 2009        | United Kingdom           | Randomized controlled trial | Antibiotics                                     | Primary care            | Intervention included an interactive booklet on respiratory tract infections, designed to be used within the consultation and then provided to patients as a take home resource; Assess parent satisfaction, level of reassurance, parental enablement or parents rating of usefulness of information received in the consultation in intervention and control |

| <b>Author</b>           | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>             | <b>Low-value practice</b>                       | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|--------------------------|---------------------------------|---|-------------------------|---|
| Fraser <sup>104</sup>   | 1997        | Canada                   | Randomized controlled trial     | Unnecessary caesarean section                   | Hospital                | Prenatal education and support program  |
| Frush <sup>105</sup>    | 2014        | United States of America | Narrative review                | Computed tomography in the Emergency Department | Emergency Department    | Engage families (and the patient if they are old enough) in decisions regarding the use of computed tomography for evaluation of pediatric patients in the Emergency Department |
| Ghanouni <sup>106</sup> | 2016        | United Kingdom           | Cross-sectional                 | Low-value care in general                       | Not specified           | Determine how the public conceptualizes the term over diagnosis as a result of potentially unnecessary screening tests  |
| Gonzales <sup>107</sup> | 2008        | United States of America | Non-randomized controlled trial | Antibiotics                                     | Primary Care            | Mass media campaign (paid outdoor advertising, earned media, and physician advocacy) to educate the public on the misuse of antibiotics   |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>                            | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-----------------------|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Green <sup>108</sup>  | 2018        | United States of America | Qualitative interviews/focus groups | Low-value care in general                            | Not specified           | Assessed patient awareness of overuse; Patients suggested that overuse may be reduced when the patient is involved in shared decision making              |
| Hemo <sup>109</sup>   | 2009        | Israel                   | Cross-sectional                     | Antibiotic use for upper respiratory tract infection | Not specified           | Media campaign to reduce antibiotic overuse among children  |
| Hersch <sup>110</sup> | 2015        | Australia                | Randomized controlled trial         | Breast cancer screening                              | Outpatient screening    | Decision aid comprising evidence-based explanatory and quantitative information on over-detection, breast cancer mortality reduction, and false positives |
| Herwig <sup>111</sup> | 2017        | Germany                  | Qualitative interviews/focus groups | Cardiac catheterization                              | Hospital                | Study will explore the patient's perspective on the overuse of cardiac catheterization  |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>            | <b>Study Design</b>                       | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|---------------------------|-------------|---------------------------|---|--|-------------------------|---|
| Hess <sup>112</sup>       | 2012        | United States of America  | Randomized controlled trial               | Cardiac stress testing in patients at low risk for acute coronary syndrome | Emergency Department    | Decision aid about cardiac stress testing to improve patient knowledge and engage in shared decision making with their care provide |
| Hess <sup>72</sup>        | 2016        | United States of American | Randomized controlled trial               | Cardiac stress testing in patients at low risk for acute coronary syndrome | Emergency Department    | Decision aid about cardiac stress testing to improve patient knowledge and engage in shared decision making with their care provide |
| Kanzaria <sup>113</sup>   | 2015        | United States of America  | Cross-sectional                           | Low-value care in general  | Emergency Department    | Patients and physicians should engage in shared decision making as a solution to reduce over-testing                                |
| Keating <sup>114</sup>    | 2018        | United States of America  | Editorial/commentary/letter-to-the-editor | Routine mammography in women under 50 years of age                         | Outpatient screening    | Patient/physician shared decision-making to reduce unnecessary breast cancer screening  |
| Khunpradit <sup>115</sup> | 2011        | Thailand                  | Systematic review                         | Unnecessary caesarean section  | Hospital                | Education/support programs; decision aids   |

| <b>Author</b>              | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>                                       | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|----------------------------|-------------|--------------------------|---------------------|---|-------------------------|---|
| Kinkade <sup>116</sup>     | 2016        | United States of America | Narrative review    | Antibiotics for cough   | Primary Care            | Educating patients on natural course of disease and unnecessary antibiotic use  |
| Kline <sup>117</sup>       | 2017        | United States of America | Cross-sectional     | Nuclear myocardial perfusion imaging (MPI)                      | Outpatient clinic       | Assessed patient knowledge of the value of MPI testing, including when it is necessary, the costs, and risks  |
| Kotwal <sup>118</sup>      | 2017        | United States of America | Narrative review    | Breast, colorectal, lung, and prostate screening in the elderly | Outpatient screening    | Shared decision-making incorporating guidelines, patient preferences and patient life expectancy estimates  |
| Kozhimannil <sup>119</sup> | 2013        | United States of America | Cohort              | Caesarean section   | Hospital                | Patient-centered decision making, providing them with the full information on risks, benefits and alternatives associated with medical care at the time of childbirth |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>                                   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|---|---|-------------------------|--|
| Kuehn <sup>120</sup>  | 2012        | United States of America | Website item/news                         | Low-value care in general                                   | Not specified           | American Board of Internal Medicine Foundation partnership with Choosing Wisely Campaign to disseminate materials to public in Consumer Reports publication                    |
| Larson <sup>121</sup> | 2010        | United States of America | Editorial/commentary/letter-to-the-editor | Imaging procedures, image-guided therapy, radiation therapy | Not specified           | Patients need to be made aware of the appropriateness of their care and use this information in their decisions  |
| Laws <sup>122</sup>   | 2012        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general                                   | Not specified           | Patient-physician discussion about avoiding inappropriate care so that patients understand that some interventions may not be necessary for their conditions and circumstances |

| <b>Author</b>         | <b>Year</b> | <b>Country</b> | <b>Study Design</b>         | <b>Low-value practice</b>                    | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|----------------|-----------------------------|--|-------------------------|--|
| Legare <sup>123</sup> | 2012        | Canada         | Randomized controlled trial | Antibiotics for respiratory tract infections | Primary care            | Shared decision-making between patient and physicians (trained in shared decision making) to discuss antibiotics; Patients evaluated decisional conflict, perception that shared decision making occurred, quality of decision made, adherence to the decision, decisional regret, repeat consultation, quality of life, and intention to participate in shared decision making in future consultations regarding the use of antibiotics |

| <b>Author</b>           | <b>Year</b> | <b>Country</b> | <b>Study Design</b>                       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|----------------|---|---------------------------|-------------------------|---|
| Legemate <sup>124</sup> | 2016        | Netherlands    | Editorial/commentary/letter-to-the-editor | Low-value care in general | Hospital                | Patients and physicians should discuss the risks associated with a procedure and the number of patients who would not benefit from the treatment to help discourage patients from choosing low-value treatments |
| Leung <sup>125</sup>    | 2017        | Japan          | Health Education/Public Outreach          | Antibiotics               | Community pharmacy      | Public competition to create videos for education on antibiotic misuse and dissemination of the video in public schools   |



| <b>Author</b>             | <b>Year</b> | <b>Country</b> | <b>Study Design</b>                       | <b>Low-value practice</b>        | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|---------------------------|-------------|----------------|---|----------------------------------|-------------------------|--|
| Levinson <sup>18</sup>    | 2014        | Canada         | Editorial/commentary/letter-to-the-editor | Low-value care in general        | Not specified           | Physicians and patients should engage in conversations about unnecessary tests, treatments, and procedures to help patients make effective choices; Educational efforts targeted to patients and the public are required in order to engage them in the dialogue |
| Levinson <sup>126</sup>   | 2014        | Canada         | Narrative review                          | Low-value care in general        | Not specified           | Choosing Wisely Campaign encourages patients to discuss low-value care with their care providers and prevent harm; Patient surveys about attitudes towards low-value care and care experiences   |
| Macfarlane <sup>127</sup> | 2002        | United Kingdom | Randomized controlled trial               | Antibiotics for acute bronchitis | Primary Care            | Information leaflet on why antibiotics aren't necessary  |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>        | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|---|----------------------------------|-------------------------|--|
| Maire <sup>128</sup>  | 2014        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general        | Not specified           | Patients and physicians should use Choosing Wisely recommendations to make effective and safe decisions on the most appropriate care based on their specific situation   |
| Martin <sup>129</sup> | 2004        | United States of America | Cross-sectional                           | Antibiotic use in rhinosinusitis | Primary Care            | Assessed patient exceptions about receiving an antibiotic prescription and how they would feel about getting a back-up prescription as a method to reduce antibiotic use |
| Mason <sup>130</sup>  | 2015        | United States of America | Website item/news                         | Low-value care in general        | Not specified           | Patients would have to pay for low-value services, particularly those that may cause harm  |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>           | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|---------------------------|-------------|--------------------------|---|-------------------------------------|-------------------------|--|
| McCaffery <sup>131</sup>  | 2016        | Australia                | Editorial/commentary/letter-to-the-editor | Low-value care in general           | Not specified           | Mass media and direct to consumer campaigns about low-value practices; shared decision making/patient decision aids; community juries to discuss what services are available or reimbursed by health funds |
| McCanne <sup>132</sup>    | 2018        | United States of America | Website item/news                         | Low-value care in general           | Not specified           | Increasing cost-sharing for low-value services to reduce their use   |
| Montgomery <sup>133</sup> | 2007        | United Kingdom           | Randomized controlled trial               | Unnecessary caesarean section       | Hospital                | Decision aid for patient use; Evaluated patient satisfaction and anxiety with the process  |
| Moore <sup>134</sup>      | 2016        | United States of America | Qualitative interviews/focus groups       | Overuse of elective labor induction | Hospital                | Shared decision-making to help women make value and preference-based decisions to reduce overuse in maternity care   |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>        | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-----------------------|-------------|--------------------------|---------------------|----------------------------------|-------------------------|---|
| Morgan <sup>135</sup> | 2017        | United States of America | Systematic review   | Low-value care in general        | Not specified           | Shared decision making using a decision aid to reduce cardiac testing for low-risk chest pain   |
| Morgan <sup>136</sup> | 2017        | United States of America | Framework           | Low-value care in general        | Not specified           | Culture of healthcare consumption may be influenced through public education (eg, Choosing Wisely patient resources) and public health campaigns; In patient-clinician interactions, shared decision making, and continuity of care likely reduce overuse |
| Morgan <sup>137</sup> | 2002        | United Kingdom           | Before-and-after    | Long term use of benzodiazepines | Primary Care            | A patient letter explaining the problems association with long term benzodiazepine use and encouraging patients to gradually reduce their intake, and contact their GP for discussion if desired  |

| <b>Author</b>           | <b>Year</b> | <b>Country</b> | <b>Study Design</b> | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|----------------|---------------------|---------------------------|-------------------------|---|
| Moynihan <sup>138</sup> | 2015        | Australia      | Cross-sectional     | Screening                 | Not specified           | Assessed knowledge of overdiagnosis as a result of low-value screening: most adults have not been informed about over diagnosis attached to screening tests, community members expressed desire for routine provision of benefits and risk of overdiagnosis |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|---|---------------------------|-------------------------|--|
| Murphy <sup>139</sup> | 2015        | United Kingdom           | Editorial/commentary/letter-to-the-editor | Blood transfusions        | Hospital                | Education of patients, for whom transfusion may be a treatment option, about individualized blood management and blood avoidance should be an integral part of relevant care pathways; Recommendations for blood management include informing patient of the risks and benefits of blood transfusion and documenting this discussion in the medical record |
| Nagler <sup>140</sup> | 2017        | United States of America | Cross-sectional                           | Mammogram                 | Outpatient screening    | Assess women's awareness of overdiagnosis and overtreatment related to breast cancer screening   |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|---|--|-------------------------|--|
| Newton <sup>141</sup> | 2017        | United States of America | Narrative review                          | Overuse in emergency medicine  | Emergency Department    | Shared decision making has been suggested as a strategy to reduce low-value care in the Emergency Department and involve patients in their care  |
| Nilsen <sup>142</sup> | 2017        | United States of America | Narrative review                          | Chemotherapy and radiation in head and neck cancer in palliative care patients | Hospital                | Patients and families should be involved in shared decision making to grant influence on patients about treatment preferences and values in treatment for head and neck cancer that fits with these preferences; Informing patients of burden and benefits of chemo and radiation therapy for palliative symptoms is important for their choices around care |
| Parmar <sup>143</sup> | 2015        | Canada                   | Editorial/commentary/letter-to-the-editor | Low-value care in general  | Not specified           | Educate patients and ensure they are aware of risks of low-value care  |

| <b>Author</b>                            | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|--|-------------|--------------------------|---------------------|---------------------------|-------------------------|---|
| Pereko <sup>144</sup>                    | 2015        | Namibia                  | Case-control        | Antibiotics               | Community pharmacy      | Assess knowledge, attitudes and behaviour of the general population regarding antibiotic misuse for cold and flu symptoms |
| Perz <sup>145</sup>                      | 2002        | United States of America | Before-and-after    | Antibiotics               | Primary Care            | Educational materials for parents of young children and the general public on the misuse of antibiotics                   |
| Prescrire Editorial Staff <sup>146</sup> | 2014        | France                   | Website item/news   | Low-value care in general | Not specified           | Involve the patient in determining the harm-benefit balance of the test/procedure   |
| Price <sup>147</sup>                     | 2013        | United Kingdom           | Narrative review    | Low-value care in general | Hospital                | Patient-provider (or surrogate-provider) discussion about preferences, goals, and the futility of the treatment           |



| <b>Author</b>           | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>       | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|--------------------------|---------------------------|---------------------------|-------------------------|---|
| Razmaria <sup>148</sup> | 2015        | United States of America | Website item/news         | Low-value care in general | Not specified           | Patients should ask physicians questions about tests and treatments: What are the risks? How will this help me? Are there any other options? What would happen if I don't do anything? Asking these questions will help reduce low-value care |
| Reid <sup>149</sup>     | 2017        | United States of America | Difference-in-differences | Low-value care in general | Not specified           | Consumer directed health plans involve greater cost-sharing for patients, which is intended to encourage more value-conscious choices   |
| Santa <sup>150</sup>    | 2012        | United States of America | Narrative review          | Low-value care in general | Not specified           | Choosing Wisely uses Consumer Reports as a tool to communicate 'what not to do' to consumers and assess their knowledge of low-value practices  |

| <b>Author</b>               | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-----------------------------|-------------|--------------------------|-------------------------------------|---|-------------------------|---|
| Sawaya <sup>151</sup>       | 2017        | United States of America | Qualitative interviews/focus groups | Pelvic examinations in asymptomatic, non-pregnant women                 | Outpatient clinic       | Providing patients with a professional society's recommendation advising against the low-value practice   |
| Schleifer <sup>152</sup>    | 2012        | United States of America | Qualitative interviews/focus groups | Low-value care in general   | Not specified           | Explore patient attitudes about the overuse of medical interventions  |
| Schlesinger <sup>34</sup>   | 2017        | United States of America | Mixed methods                       | Low-value care in general   | Not specified           | Assessed consumers knowledge and attitude towards low-value care, assessed the impact of the framing of messages from media campaigns (i.e. Choosing Wisely) on their knowledge, attitudes and intentions |
| Schneiderman <sup>153</sup> | 2003        | United States of America | Randomized controlled trial         | Non-beneficial life-sustaining treatments in the intensive care setting | Hospital                | Ethics consultations to discuss relevant medical factors, values and preferences, other contextual factors and help reduce the use of non-beneficial life-sustaining treatments                           |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|---------------------------|-------------|--------------------------|---|---|-------------------------|---|
| Scott <sup>154</sup>      | 2013        | Australia                | Narrative review                          | Low-value care in general   | Not specified           | Empower patients to participate in shared decision making to reduce demand for low-value care   |
| Shallcross <sup>155</sup> | 2015        | United Kingdom           | Editorial/commentary/letter-to-the-editor | Antibiotics   | Not specified           | Public media campaigns to raise awareness about overuse of antibiotics  |
| Sheridan <sup>156</sup>   | 2015        | United States of America | Randomized controlled trial               | Prostate screening in men ages 50-69, osteoporosis screening in low-risk women ages 50-64, colorectal screening in men and women ages 76-85 | Outpatient screening    | Provided one-page evidence-based decision support sheets in different formats (words, numbers, narratives, etc.) and tested intention to screen before and after reading the decision support sheet |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|---------------------------|-------------|--------------------------|---------------------|--|-------------------------|---|
| Silverstein <sup>36</sup> | 2016        | Canada                   | Cross-sectional     | Annual ECG testing, use of antipsychotic drugs for patients with dementia, use of antibiotics for treatment of sinusitis, imaging for low back pain, sedative-hypnotic use in patients with insomnia | Primary Care            | Assessed knowledge, attitudes and behaviours around low-value practices before and after exposure to a Choosing Wisely Canada patient educational brochure  |
| Simpson <sup>157</sup>    | 2010        | United States of America | Before-and-after    | Elective labour induction  | Hospital                | Educational classes on induction risk   |
| Singh <sup>158</sup>      | 2017        | United States of America | Pilot study         | Head computed tomography for minor head injury   | Emergency Department    | Clinician and patient facing electronic tool to guide decisions about computed tomography use, promotes conversation around individualized risk and concerns; Measured patient satisfaction with the way information was shared during the encounter and their trust in physician |

| <b>Author</b>                    | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|----------------------------------|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Spong <sup>159</sup>             | 2015        | United States of America | Narrative review                    | Unnecessary caesarean delivery   | Hospital                | Educating patients on the risks associated with caesarean delivery and importance of vaginal delivery   |
| Sutkowi-Hemstreet <sup>160</sup> | 2015        | United States of America | Qualitative interviews/focus groups | Overused screening tests (prostate cancer, osteoporosis, colon cancer, cardiovascular disease) | Outpatient screening    | Assessed how patients think about the harms and benefits of overused screening tests and how they consider these factors when making decisions  |
| Tannenbaum <sup>161</sup>        | 2014        | Canada                   | RCT                                 | Benzodiazepine therapy   | Community pharmacy      | 8-page booklet including a self-assessment about risks, evidence of potential harms, champion stories and a tapering protocol, and encouragement to discuss this decision with physician or pharmacist; Assessment of patient satisfaction about learning about the risks of benzodiazepine use |

| <b>Author</b>              | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>                  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|----------------------------|-------------|--------------------------|---|--|-------------------------|--|
| Taylor <sup>162</sup>      | 2003        | United States of America | RCT                                       | Antibiotics                                | Primary Care            | Providing parents with educational materials about judicious antibiotics usage   |
| Torke <sup>163</sup>       | 2013        | United States of America | Qualitative interviews/focus groups       | Cancer screening for persons with dementia | Outpatient screening    | Assessed caregivers' perspectives towards stopping screening for their relative and their knowledge of the potential risks |
| Torke <sup>164</sup>       | 2013        | United States of America | Qualitative interviews/focus groups       | Cancer screening                           | Outpatient screening    | Explored patient knowledge and perspectives on cancer screening cessation  |
| Tuso <sup>165</sup>        | 2013        | United States of America | Editorial/commentary/letter-to-the-editor | Chronic dialysis                           | Hospital                | Shared decision making surrounding the initiation of chronic dialysis and/or withdrawing treatment towards the end of life |
| VBID Health <sup>166</sup> | 2017        | United States of America | Narrative review                          | Low-value care in general                  | Not specified           | Patients pay higher co-payment for low-value services  |

| <b>Author</b>                 | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------------|-------------|--------------------------|---|--|-------------------------|---|
| Veet <sup>167</sup>           | 2017        | United States of America | Cross-sectional                           | Daily labs in stable patients with no new symptoms   | Hospital                | Assess patient understanding and preference regarding daily labs  |
| Volpp <sup>168</sup>          | 2012        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general  | Not specified           | Patients pay higher co-payments for low-value services  |
| Walsh-Childers <sup>169</sup> | 2018        | United States of America | Qualitative interviews/focus groups       | Low-value care in general  | Not specified           | Assessing journalists understanding of over treatment and the reporting of over treatment in the media                |
| Warner <sup>170</sup>         | 2016        | United States of America | Cross-sectional                           | Computed tomography for headache (no red flags), antibiotics for upper respiratory tract infection | Primary Care            | Assessed patient perceptions about low-value care using vignettes and potential responses from primary care providers |
| Weiner <sup>171</sup>         | 2013        | United States of America | Website item/news                         | Low-value care in general  | Not specified           | Choosing Wisely campaign encourages patients to discuss whether or not they need this test                            |
| Wen <sup>172</sup>            | 2015        | United States of America | Website item/news                         | Low-value care in general  | Emergency Department    | Shared decision-making to avoid unnecessary tests and procedures  |

| <b>Author</b>           | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|--------------------------|---------------------|----------------------------|-------------------------|---|
| Wennberg <sup>173</sup> | 2007        | United States of America | Narrative review    | Low-value care in general  | Hospital                | Medicare beneficiaries use shared decision-making when facing the decision about discretionary surgery              |
| Wheeler <sup>174</sup>  | 2001        | United States of America | Cohort              | Antibiotics                | Primary Care            | Educational videotape about the judicious use of antibiotics played in waiting rooms of pediatric physician offices |
| Wright <sup>175</sup>   | 2017        | United States of America | Cohort              | Intensive glycemic control | Primary Care            | Shared decision-making with patients to reduce the use of intensive glycemic control                                |

*Low-value care research*



| <b>Author</b>          | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>         | <b>Low-value practice</b>       | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|------------------------|-------------|--------------------------|-----------------------------|---------------------------------|-------------------------|--|
| Althabe <sup>176</sup> | 2004        | Uruguay                  | Randomized controlled trial | Non-emergency caesarean section | Hospital                | Patients receive a mandatory second opinion to reduce rates of unnecessary c-section; Outcomes included patient perceptions and satisfaction with the process of care and acceptability of the second opinion strategy |
| Ashurst <sup>177</sup> | 2014        | United States of America | Pilot study                 | Radiography                     | Emergency Department    | Physicians used guidelines to decide if radiography was necessary and after discharge, patient satisfaction with care received was assessed on a 5-point Likert scale  |
| Barker <sup>178</sup>  | 2016        | India                    | Mixed methods               | Antibiotics                     | Community pharmacy      | Assessed community member knowledge of antibiotic misuse; asked community members how factors such as knowledge, access, and poverty related to antibiotic misuse  |

| <b>Author</b>                                   | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>                    | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|---|-------------|--------------------------|---------------------|--|-------------------------|---|
| Blackmore <sup>179</sup>                        | 2011        | United States of America | Case report         | Imaging tests for uncomplicated headache     | Emergency Department    | Assessing patient satisfaction after implementing an initiative to reduce imaging tests for uncomplicated headache  |
| Canadian Psychiatric Association <sup>180</sup> | 2017        | Canada                   | Website item/news   | Low-value tests and treatments in psychiatry | Not specified           | A person with lived experience from the Canadian Mental Health Association was involved in the development of the Canadian Psychiatric Association's Choosing Wisely List |
| Cho <sup>181</sup>                              | 2018        | United States of America | Consensus method    | Low-value care in general                    | Hospital                | Patient advocates were involved in co-creating a list of opportunities in overuse and underuse for improving value in hospital medicine                                   |

| <b>Author</b>         | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>         | <b>Low-value practice</b>                          | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-----------------------|-------------|--------------------------|-----------------------------|--|-------------------------|--|
| Chow <sup>182</sup>   | 2015        | Canada                   | Consensus method            | Low-value tests and treatments in Rheumatology     | Not specified           | Patient involvement in identifying and prioritizing 5 low-value practices for the Canadian Rheumatology Association's Choosing Wisely list   |
| Goggin <sup>183</sup> | 2017        | United States of America | Randomized controlled trial | Antibiotics for acute respiratory tract infections | Outpatient clinic       | Production of a video and brochure on antibiotic misuse; Conduct focus groups with parents to inform the design of the study and partner with a Parent Research Associate for the duration of the study; Parents will assess the experience of shared decision making, quality of parent-provider communication, and overall satisfaction with the visit |

| <b>Author</b>           | <b>Year</b> | <b>Country</b>            | <b>Study Design</b>            | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|---------------------------|--------------------------------|---|-------------------------|---|
| Gonzales <sup>184</sup> | 2005        | United States of American | Non-randomize controlled trial | Antibiotics for children with pharyngitis, antibiotics for adults with acute bronchitis | Primary care            | Educational intervention: materials mailed to households, materials available in physicians' offices, waiting rooms and exam rooms, describing the misuse of antibiotics; Focus groups with parents to develop and obtain feedback on pediatric educational materials prior to distribution |
| Ho <sup>185</sup>       | 2015        | United States of America  | Consensus method               | Low-value tests and treatments in newborn medicine                                      | Not specified           | Choosing Wisely list development: family representatives attending the Vermont Oxford Network Annual Congress were part of the national survey to identify low-value practices in newborn medicine for the consensus study as well as part of the panel for the consensus study.            |

| <b>Author</b>            | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>                        | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|--------------------------|-------------|--------------------------|---|--|-------------------------|---|
| Lee <sup>186</sup>       | 2017        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general                        | Not specified           | Patient involvement in developing Choosing Wisely lists   |
| Lemiengre <sup>187</sup> | 2014        | Belgium                  | Randomized controlled trial               | Antibiotic prescribing for self-limiting disease | Primary care            | Provide caregivers with written safety net advice on the antibiotic prescribing rate in acutely ill children not suspected of serious disease; Parents assessed clarity and readability of the leaflet used in the intervention; Evaluate parental perception of communication, parental satisfaction |
| Maratt <sup>188</sup>    | 2018        | United States of America | Systematic review                         | Low-value care in general                        | Not specified           | Patient satisfaction, quality of life in relation to the outcome of an intervention to reduce low-value care  |

| <b>Author</b>          | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b>                                     | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|------------------------|-------------|--------------------------|---------------------|---|-------------------------|--|
| Melnick <sup>189</sup> | 2017        | United States of America | Feasibility study   | CT use in Emergency Department                                | Emergency Department    | Electronic tool to promote evidence-based conversation/shared decision making about the need for CT use; Patients were consulted during development of the tool  |
| Nguyen <sup>190</sup>  | 2017        | Canada                   | Consensus method    | Low-value tests and treatments for Inflammatory Bowel Disease | Not specified           | Choosing Wisely list development: 2 patient representatives participated in the face to face discussion day which was part of the third round of the modified Delphi process, however the patients did not vote. This discussion moved from 10 candidate items to the final 5. |

| <b>Author</b>        | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|----------------------|-------------|--------------------------|---------------------|---------------------------|-------------------------|---|
| Omaki <sup>191</sup> | 2018        | United States of America | Pilot study         | Opioids                   | Emergency Department    | My Healthy Choice materials were produced to inform patients about environmental and personal risk factors associated with opioid use; Development of the program was informed by qualitative interviews with patients and refined and tailored by patients; Patient satisfaction with physician encounter and assessment of decision making process after sharing My Health Choices materials with physician |

| <b>Author</b>             | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|---------------------------|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Porath <sup>192</sup>     | 2018        | United States of America | Cross-sectional                     | Diagnostic tests for low risk chest pain and mild traumatic brain injury | Emergency Department    | Investigated individual level trade-offs between the benefits, risks, and cost of a low-value diagnostic test within hypothetical acute medical conditions commonly seen in an ED |
| Rice <sup>193</sup>       | 2018        | Canada                   | Qualitative interviews/focus groups | Blood transfusions for iron deficiency anemia (IDA)                      | Hospital                | Patient focus groups to help develop patient education materials for reducing blood transfusions for IDA  |
| Shorten <sup>194</sup>    | 2003        | Australia                | Pilot study                         | Unnecessary caesarean section  | Hospital                | Decision aids for patients; Patients were involved in developing and refining the decision aid  |
| Stepanczuk <sup>195</sup> | 2017        | United States of America | Qualitative interviews/focus groups | Low-value care in general  | Not specified           | Patients described barriers and facilitators to accepting their physician's recommendation to avoid a low-value practice  |



| <b>Author</b>              | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|----------------------------|-------------|--------------------------|-------------------------------------|--|-------------------------|---|
| Trojanowski <sup>196</sup> | 2018        | United States of America | Qualitative interviews/focus groups | Antibiotics for urinary tract infections in long term care homes | Long term care          | Focus groups with residents/families to understand barriers and facilitators to reducing antibiotic use in long term care homes; Focus groups with residents/families to assess the content, readability, and usability of an educational handout and video to address informational needs and improve communication between residents/families and care providers about why antibiotics will not be prescribed |

---

*Healthcare administration and policy*

---

| <b>Author</b>           | <b>Year</b> | <b>Country</b>           | <b>Study Design</b> | <b>Low-value practice</b> | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|-------------------------|-------------|--------------------------|---------------------|---------------------------|-------------------------|--|
| Bosslet <sup>197</sup>  | 2015        | United States of America | Consensus method    | Low-value care in general | Hospital                | Engaging patients to develop societal policies and legislation about the appropriate boundaries of medical practice and futile care near the end of life                                   |
| Degeling <sup>198</sup> | 2017        | Australia                | Community Juries    | Antibiotic overuse        | Primary Care            | Community juries to elicit views on the acceptability of proposed policy interventions designed to reduce the misuse of antibiotics in Australia   |
| Elshaug <sup>199</sup>  | 2009        | Canada                   | Policy paper        | Low-value care in general | Not specified           | Involving patient and citizen groups to further a disinvestment agenda   |
| Elshaug <sup>1</sup>    | 2017        | Australia                | Policy paper        | Low-value care in general | Not specified           | Public engagement to improve priority setting at the highest policy level, Patient engagement in clinical decision making to maximize value (especially when care is preference sensitive) |

| <b>Author</b>                                  | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                       | <b>Low-value practice</b>                 | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|--|-------------|--------------------------|---|---|-------------------------|--|
| Hodgetts <sup>76</sup>                         | 2014        | Australia                | Community Juries                          | Assisted reproductive technologies (ARTs) | Outpatient clinic       | Forums with past patients and community members to discuss disinvestment and how to best distribute funding for ARTs   |
| Ginsburg <sup>16</sup>                         | 2010        | United States of America | Editorial/commentary/letter-to-the-editor | Low-value care in general                 | Not specified           | Assessed consumers' views on increased cost sharing or reduced coverage for less effective treatments                  |
| Healthcare Improvement Scotland <sup>200</sup> | 2013        | United Kingdom           | Narrative review                          | Low-value care in general                 | Not specified           | Public involvement in decision making relating to potential disinvestment in healthcare interventions and technologies |
| Hollingworth <sup>201</sup>                    | 2015        | United Kingdom           | Mixed methods                             | Low-value care in general                 | Not specified           | Focus groups to explore patient perspectives on the candidate practice and potential disinvestment process             |

| <b>Author</b>           | <b>Year</b> | <b>Country</b> | <b>Study Design</b> | <b>Low-value practice</b>   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|----------------|---------------------|---|-------------------------|---|
| Lee <sup>202</sup>      | 2017        | Canada         | Quality Improvement | Benzodiazepines, stool softeners, proton pump inhibitors, multivitamins, antipsychotics | Hospital                | Hospital's patient advisors were involved in implementing Choosing Wisely suggestions within the hospital   |
| Lenaghan <sup>203</sup> | 1999        | United Kingdom | Narrative review    | Low-value care in general   | Not specified           | Citizen's juries to engage the public in debates about the allocation of finite resources of healthcare   |
| Minogue <sup>204</sup>  | 2016        | United Kingdom | Narrative review    | Low-value care in general   | Not specified           | Focus groups with public to discuss how they can be engaged in National Health Service financial decision making - patients felt they were the best judges of value and should be more involved in deciding which practices were of value |

| <b>Author</b>              | <b>Year</b> | <b>Country</b> | <b>Study Design</b> | <b>Low-value practice</b>                           | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|----------------------------|-------------|----------------|---------------------|---|-------------------------|--|
| NHS England <sup>205</sup> | 2017        | United Kingdom | Website item/news   | Low-value care in general                           | Primary Care            | Public consultation on the development of national guidelines that identify medicines and treatments that should not be prescribed in primary care |
| NHS England <sup>206</sup> | 2017        | United Kingdom | Community Juries    | Low-value drugs commonly prescribed in primary care | Primary Care            | Surveys, webinars, engagement events to solicit feedback on a list of items that should not be routinely prescribed in primary care                |

| <b>Author</b>                            | <b>Year</b> | <b>Country</b> | <b>Study Design</b> | <b>Low-value practice</b>                                   | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|--|-------------|----------------|---------------------|---|-------------------------|--|
| Nicholls <sup>207</sup>                  | 2014        | Canada         | Narrative review    | Expanded newborn screening                                  | Not specified           | Public attitudes toward expanded newborn screening largely reflect professional and academic debates, with an emphasis on support for programs where the primary benefit is intervention for the child that will improve health outcomes; Research should to explore policy decision maker perspectives with respect to consent to newborn screening, and implications for parent understanding. |
| Ontario Citizen's Council <sup>208</sup> | 2011        | Canada         | Website item/news   | Drugs on the Formulary for the Ontario Public Drug Programs | Not specified           | Ontario Citizens' Council provided input and insight towards when drug products should be delisted from the formulary  |

| <b>Author</b>            | <b>Year</b> | <b>Country</b>           | <b>Study Design</b>                 | <b>Low-value practice</b>     | <b>Clinical setting</b> | <b>Strategy for public involvement</b>   |
|--------------------------|-------------|--------------------------|-------------------------------------|-------------------------------|-------------------------|--|
| Parchman <sup>209</sup>  | 2017        | United States of America | Framework                           | Low-value care in general     | Not specified           | Patients were on the advisory committee that conducted a literature review, selected sites for environmental scan and created a framework for engaging providers and patients in reducing low-value care |
| Rychetnik <sup>210</sup> | 2014        | Australia                | Community Juries                    | Prostate cancer screening     | Outpatient screening    | Community jury on government investment in prostate cancer screening   |
| Seo <sup>211</sup>       | 2016        | South Korea              | Systematic review                   | Low-value care in general     | Not specified           | Patient involvement in health technology reassessment by providing input and participating in the process  |
| Street <sup>77</sup>     | 2015        | Australia                | Qualitative interviews/focus groups | Vitamin B12 pathology testing | Primary Care            | Deliberative forum to develop criteria to support disinvestment of the publicly funded pathology test  |

| <b>Author</b>           | <b>Year</b> | <b>Country</b> | <b>Study Design</b> | <b>Low-value practice</b>  | <b>Clinical setting</b> | <b>Strategy for public involvement</b>  |
|-------------------------|-------------|----------------|---------------------|--|-------------------------|---|
| Vernazza <sup>212</sup> | 2018        | United Kingdom | Consensus method    | Low-value care in general  | Dentistry               | Involving patient representatives in the Program Budgeting and Marginal Analysis (PBMA) process to define areas for disinvestment                           |
| Watt <sup>213</sup>     | 2012        | Australia      | Community Juries    | Assisted reproductive technologies, vitamin B12 and folate pathology tests | Not specified           | Involving community members in the decision-making process for disinvestment; asking community members about the barriers and facilitators of disinvestment |



**Table 2.5 Characteristics of included citations (n=151)**

| <b>Characteristic</b>                   | <b>N (%)</b> |
|---|--------------|
| Year of publication                     |              |
| 1980-1999                               | 3 (2.0)      |
| 2000-2009                               | 22 (14.6)    |
| 2010-2018                               | 126 (83.4)   |
| Continent of origin                     |              |
| North America                           | 104 (68.9)   |
| Europe                                  | 28 (18.5)    |
| Australia                               | 12 (7.9)     |
| Asia                                    | 5 (3.3)      |
| Africa                                  | 1 (0.7)      |
| South America                           | 1 (0.7)      |
| Type of article                         |              |
| Original Research                       | 99 (65.6)    |
| Observational                           | 33 (21.9)    |
| Qualitative                             | 18 (11.9)    |
| Randomized controlled trials            | 16 (10.6)    |
| Non-randomized experimental             | 10 (6.6)     |
| Knowledge synthesis                     | 9 (6.0)      |
| Consensus method                        | 6 (4.0)      |
| Community jury                          | 5 (3.3)      |
| Other*                                  | 2 (1.3)      |
| Non-original research                   | 52 (34.4)    |
| Narrative review                        | 21 (13.9)    |
| Editorial/commentary                    | 19 (12.6)    |
| Website item/news                       | 10 (6.6)     |
| Policy report                           | 2 (1.3)      |
| Type of low-value care                  |              |
| Low-value care in general               | 65 (43.0)    |
| Specific low-value practice(s)          | 86 (57.0)    |
| Test                                    | 29 (19.2)    |
| Treatment                               | 47 (31.1)    |
| Both                                    | 10 (6.6)     |
| Clinical setting                        |              |
| Hospital                                | 27 (17.9)    |
| Primary care                            | 26 (17.2)    |
| Emergency Department                    | 16 (10.6)    |
| Community <sup>†</sup>                  | 21 (13.9)    |
| Not specified                           | 61 (40.4)    |
| Level of public engagement <sup>‡</sup> |              |
| Patient interaction                     | 117 (77.5)   |
| Research                                | 23 (15.2)    |
| Policy/administration                   | 27 (17.9)    |

\*Includes one case report and one public health outreach study

<sup>†</sup>Includes outpatient clinics, long term care homes, and community pharmacies

<sup>‡</sup>Describes where public involvement occurred. Clinical interaction: strategies for public involvement that were employed during a clinical interaction such as a primary care visit; Research: involving the public in conducting or evaluating research aiming to reduce low-value care such as patient-reported outcomes; Policy/administration: involving the public in policy or administration level initiatives to reduce low-value care, such as prioritizing practices for disinvestment.

**Table 2.6 Stakeholder perspectives on how the public should be involved in reducing low-value care**

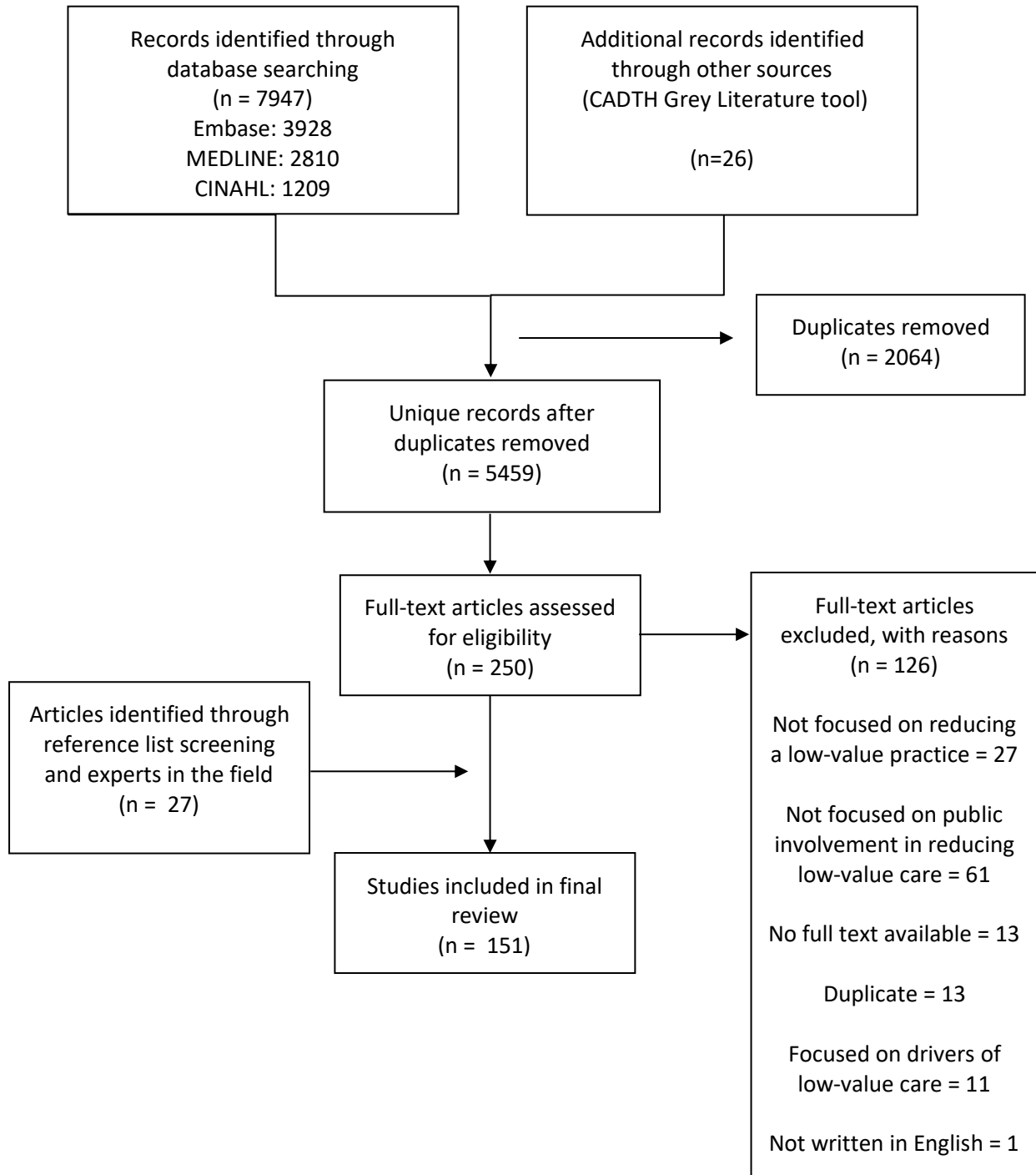
| <b>Study (year)</b>              | <b>Country</b> | <b>Study Design</b>         | <b>Stakeholder</b> | <b>Setting</b> | <b>Low-value practice(s)</b>                                 | <b>Strategy for public involvement</b>               | <b>Supportive of strategy?</b>  |
|----------------------------------|----------------|-----------------------------|--------------------|----------------|--|--|---|
| <b>Demand-side stakeholders*</b> |                |                             |                    |                |  |  |   |
| Kullgren <sup>82</sup> (2018)    | United States  | Focus groups                | Patients (seniors) | Not specified  | Multiple (potentially harmful medications, cancer screening) | Shared decision-making                               | Yes; patients felt that understanding risks and benefits and reaching a personalized decision would help them support CW recommendations                          |
| Linsky <sup>73</sup> (2014)      | United States  | Interviews and focus groups | Patients           | Primary care   | Unnecessary medications                                      | Shared decision-making                               | Yes; main theme from focus groups and interviews was the importance of strong patient-provider relationships, trust, and SDM for reducing unnecessary medications |
| Hislop <sup>62</sup> (2011)      | United Kingdom | Interviews                  | Community members  | Government     | Low-value care in general                                    | Citizen involvement in disinvestment decision-making | No; community members interviewed felt that taxpayers do not have the knowledge and impartiality required to be involved in decision making                       |

| <b>Study (year)</b>                         | <b>Country</b> | <b>Study Design</b>    | <b>Stakeholder</b>         | <b>Setting</b>    | <b>Low-value practice(s)</b>                     | <b>Strategy for public involvement</b>               | <b>Supportive of strategy?</b>  |
|---|----------------|------------------------|----------------------------|-------------------|--|--|---|
| Rohrbacher <sup>83</sup> (2008)             | Germany        | Telephone survey       | Patients                   | Not specified     | Low-value care in general                        | Shared decision-making                               | Yes; patients want to discuss their preferences and personal experiences with their physician to arrive at the most evidence-based decision |
| Schoenborn <sup>74</sup> (2017)             | United States  | Interviews             | Patients (seniors)         | Ambulatory clinic | Cancer screening when life expectancy is limited | Shared decision-making                               | Yes; patients indicated preference for a trusting relationship with their physician and an individualized decision-making process           |
| <b>Supply-side stakeholders<sup>†</sup></b> |                |                        |                            |                   |  |  |   |
| Daniels <sup>63</sup> (2018)                | United Kingdom | Q-study and interviews | Physicians, administrators | Government        | Low-value care in general                        | Citizen involvement in disinvestment decision making | Yes (cautious); Participants held an overall supportive but cautious stance to citizen involvement  |

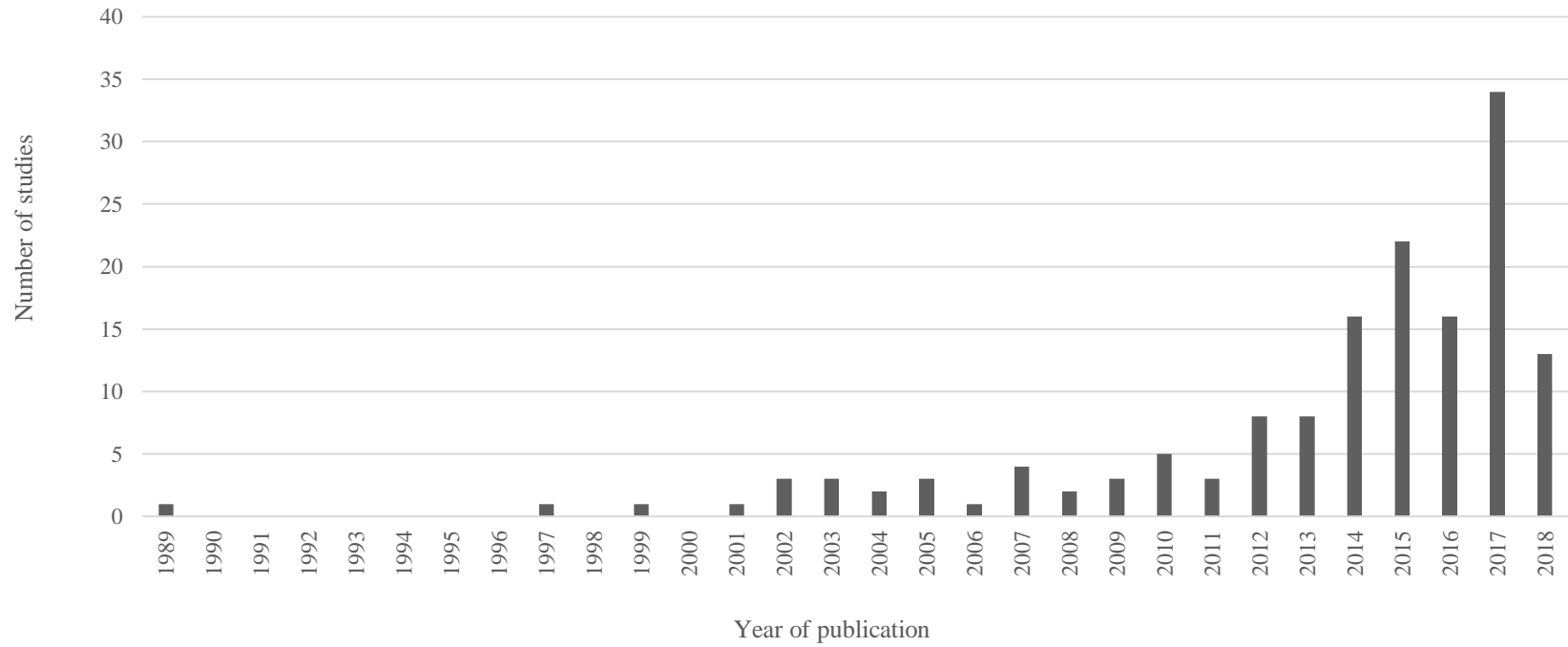
| <b>Study (year)</b>           | <b>Country</b> | <b>Study Design</b> | <b>Stakeholder</b> | <b>Setting</b>       | <b>Low-value practice(s)</b> | <b>Strategy for public involvement</b>  | <b>Supportive of strategy?</b>  |
|-------------------------------|----------------|---------------------|--------------------|----------------------|------------------------------|---|---|
| Kanzaria <sup>64</sup> (2015) | United States  | Survey              | ED physicians      | ED                   | Advanced diagnostic imaging  | Educating patients and families on low-probability outcomes, shared decision-making | 92% of Emergency Physicians surveyed indicated that SDM would be helpful in reducing low-value diagnostic imaging |
| Scales <sup>65</sup> (2017)   | United States  | Survey              | Physicians, nurses | Long term care homes | Unnecessary antibiotics      | Educating residents and families about why antibiotics aren't necessary             | Yes; survey findings supported education as a tool to help reduce unnecessary antibiotic use                      |

\*Stakeholders that receive healthcare (e.g., patients, community members, etc.), †Stakeholders that contribute to the provision of healthcare (e.g., physicians, policy-makers, etc.), ED: Emergency Department

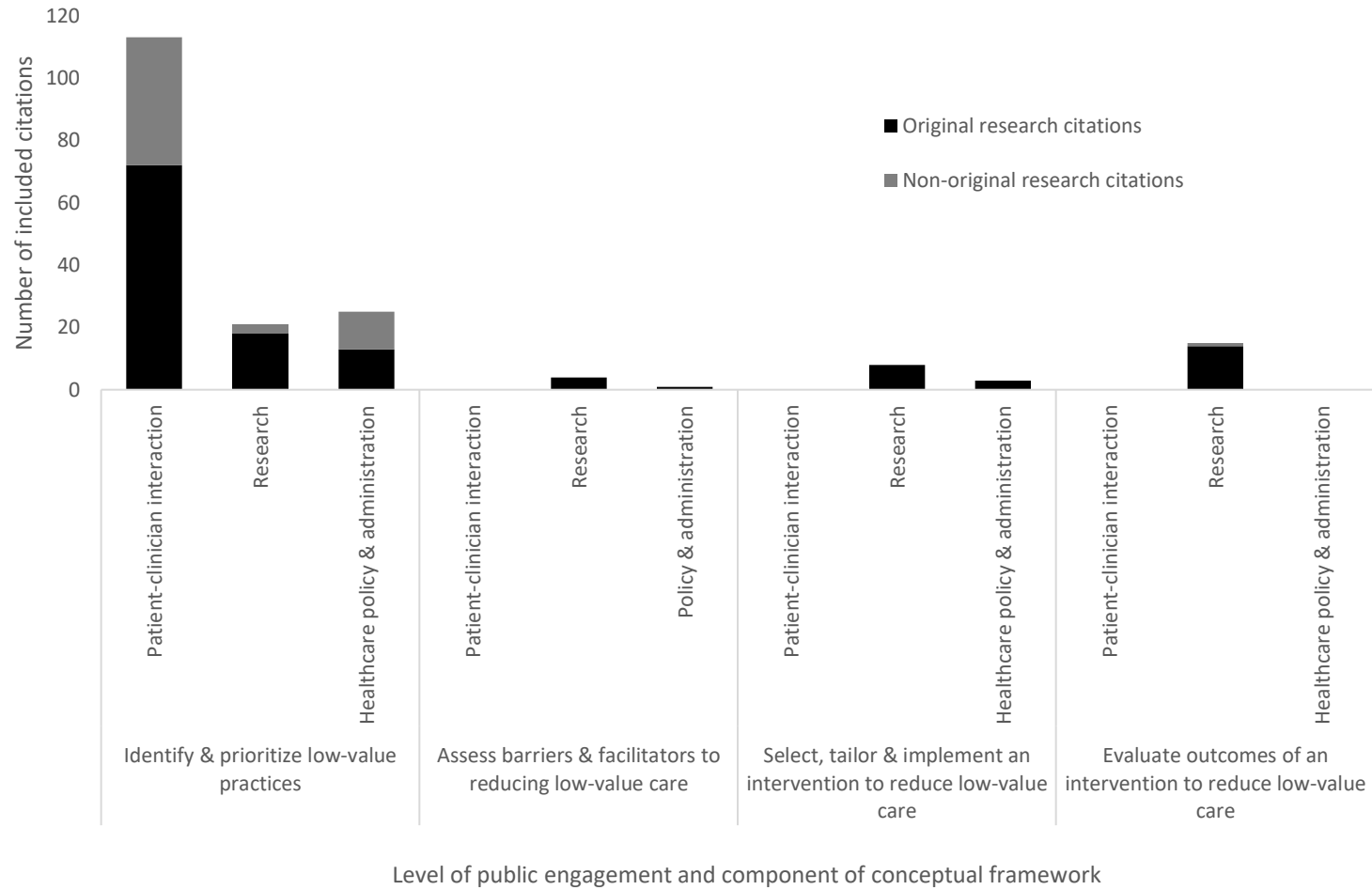
**Figure 2.1 Selection of studies included in the review**



**Figure 2.2 Year of publication of included studies (n=151)**



**Figure 2.3 Classification of included studies (n=151) according to main components of the conceptual framework and level of public engagement**

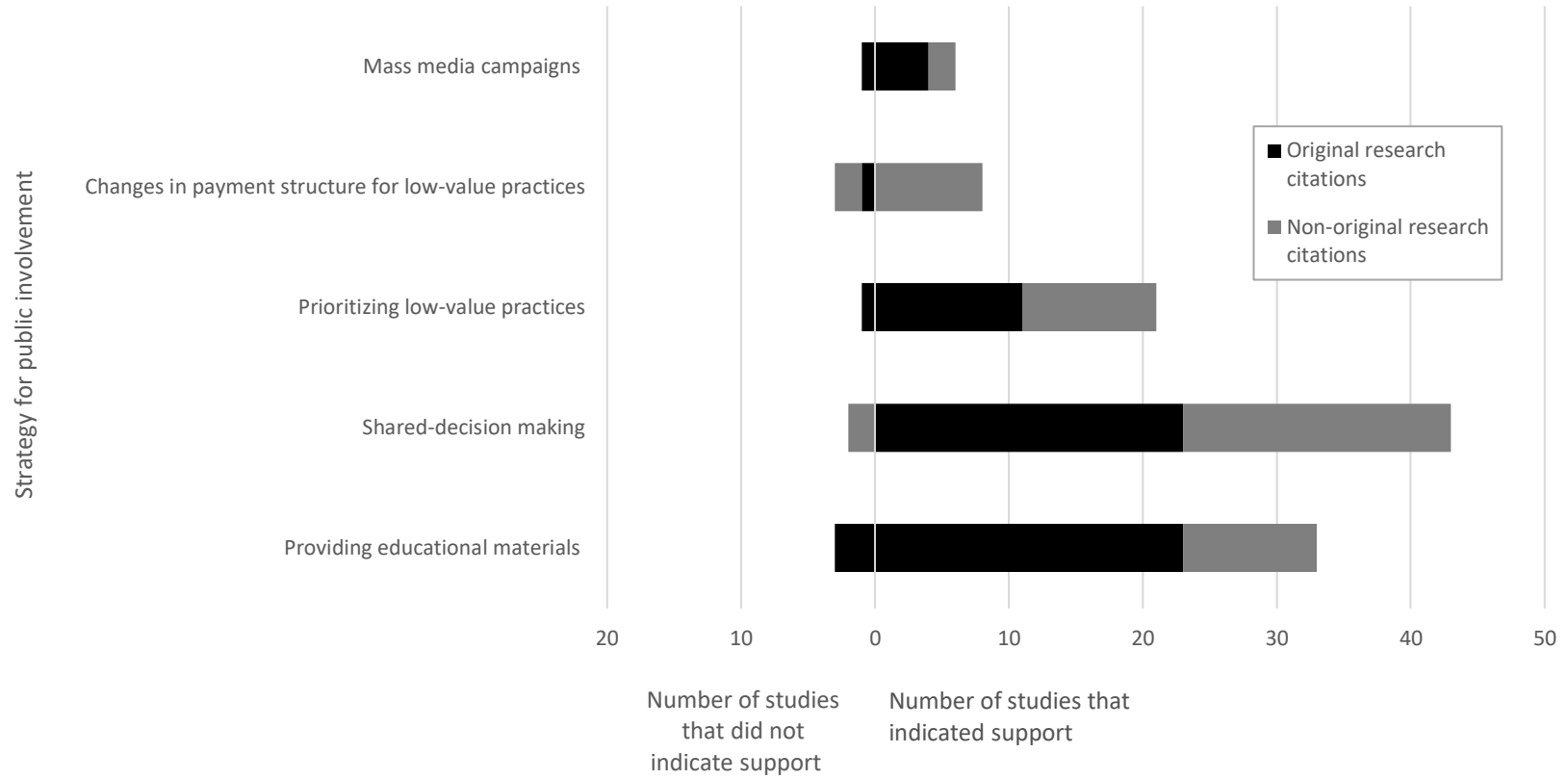


**Figure 2.4 Strategies for public involvement in reducing low-value care identified from included citations, according to main components of the conceptual framework and level of public engagement**

|                                    |   | <b>Component of conceptual framework for reducing low-value care</b>                              |   |   |   |
|------------------------------------|---|---|---|---|---|
|                                    |   | <b>Identify &amp; prioritize low-value practices</b>  | <b>Assess barriers &amp; facilitators to reducing low-value care</b>  | <b>Select, tailor &amp; implement intervention to reduce low-value care</b>                       | <b>Evaluate outcomes of an intervention to reduce low-value care</b>        |
| <b>Level of public involvement</b> | <b>Patient-<br/>clinician<br/>interaction</b>         | Shared decision-making<br><br>Patient education materials   | n/a   | n/a   | n/a   |
|                                    | <b>Research</b>                                       | Delphi process to prioritize a list of low-value practices that involves a patient representative | Focus groups with patients and caregivers to explore barriers and facilitators to reducing a low-value practice | Patient representative involved with the design of an intervention to reduce a low-value practice | Patient reported outcomes in an intervention to reduce a low-value practice |
|                                    | <b>Healthcare<br/>policy &amp;<br/>administration</b> | Involving citizens in disinvestment decisions   | Asking community members about the barriers and facilitators to disinvestment                                   | Involving patient advisors in the implementation of CW recommendations within a hospital          | n/a   |



**Figure 2.5 Reported utility of strategies for public involvement in reducing low-value care studies**



**CHAPTER THREE: PATIENT-TARGETED INTERVENTIONS TO REDUCE  
LOW-VALUE CARE: A SYSTEMATIC REVIEW AND META-ANALYSIS**

### 3.1 Abstract

**Importance:** Reducing the use of low-value tests and treatments (i.e., low-value care) is essential to the provision of high quality, sustainable healthcare. The role of patients in reducing low-value care is unclear.

**Objective:** To determine whether de-implementation interventions that engage patients and their caregivers decrease use of low-value care.

**Data Sources:** MEDLINE, Embase, and CINAHL databases to June 2018; grey literature using the CADTH tool.

**Study Selection:** Studies were screened independently by two reviewers and were eligible for inclusion if they: 1) described an intervention that included patients in an initiative to reduce low-value care; and 2) reported use of low-value care with and without the intervention. Studies describing clinician-targeted interventions or published in a language other than English were excluded.

**Data Extraction and Synthesis:** Data was extracted independently in duplicate and pertained to: the low-value practice of interest; components of the intervention; and study outcomes. Quality of included studies was assessed using the Cochrane Risk of Bias tool for randomized clinical trials (RCTs) and a modified Downs and Black Checklist for non-randomized intervention studies. Random-effects meta-analysis was used to estimate the association between patient-targeted interventions and the use of low-value practices, with results reported as risk ratios (RR) with 95% CI.

**Main Outcome(s) and Measure(s):** Proportion of patients that received low-value care.

**Results:** Reviewers screened 5,459 citations by title and abstract and 151 by full text, of which eight RCTs and 10 non-randomized intervention studies were included. Studies

mostly originated from the United States (n=10, 56%), targeted treatments (n=15, 83%) and took place in primary care settings (n=10, 56%). The most common patient-targeted interventions were direct education (n=12, 67%) and shared decision-making (n=7, 39%). Twelve studies were included in the meta-analysis which demonstrated that patient-targeted interventions led to a significant reduction in use of low-value care in both RCTs (n=7) (RR 0.75; 95% CI 0.66-0.84) and non-randomized studies (n=5) (RR 0.68; 95% CI 0.48-0.98). This effect remained significant when analysis was restricted to RCTs at low risk of bias (n=5) (RR 0.69; 95% CI 0.58-0.83).

**Conclusions and Relevance:** Patient-targeted de-implementation interventions are effective strategies for reducing low-value care.

## **3.2 Introduction**

Medical practices that are unnecessary, potentially harmful, or not cost-effective constitute low-value care.<sup>1</sup> In the United States, low-value care is estimated to cost \$210 billion annually,<sup>46</sup> and is associated with adverse events, poor patient outcomes, and downstream use of additional healthcare resources.<sup>31,33,214</sup> Reducing use of low-value care through a process of de-implementation is therefore imperative for high quality, sustainable healthcare.

The drive to improve the value of care has led to the development of strategies that engage patients to play an active role in reducing low-value care.<sup>55,56</sup> For example, the Choosing Wisely campaign has embraced the patient-clinician interaction as an opportunity for patients and clinicians to discuss the necessity of tests and treatments and ultimately reduce the use of those that are low-value.<sup>17</sup> A systematic review of interventions to reduce low-value care conducted in 2017 reported that 18% of included studies had a patient engagement component.<sup>51</sup> However, the role of patients in reducing low-value care was not evaluated and remains unclear. In this study, we conducted a systematic review with meta-analysis to determine whether de-implementation interventions that engage patients and/or their caregivers decrease use of low-value care.

## **3.3 Methods**

### ***3.3.1 Protocol and Guidance***

This systematic review and meta-analysis was conducted as a follow-up to a scoping review that described the literature exploring the role of the public in reducing low-value

care,<sup>215</sup> the protocol for which was registered with Open Science Framework on November 19, 2018 (<https://osf.io/6fsxm>). Methodology was guided by the Joanna Briggs Institute Reviewer's Manual<sup>216</sup> and reporting of methods and results was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist.<sup>217</sup>

### ***3.3.2 Search Strategy and Data Sources***

We searched MEDLINE, Embase, and CINAHL from inception to June 28, 2018 and the grey literature using the Canadian Agency for Drugs and Technologies in Health (CADTH) Grey Literature Search Tool.<sup>60</sup> The search strategy (Table 3.1) was developed in consultation with a medical librarian and was peer reviewed by a second medical librarian using the Peer Review of Electronic Search Strategies (PRESS) Checklist.<sup>59</sup> Our search terms included keywords and synonyms pertinent to three main concepts: 1) low-value care (e.g., overuse, de-implementation); 2) the public (e.g., citizens, patients); and 3) public involvement (e.g., patient participation). Searches were limited to the English language as terminology regarding low-value care (e.g., Choosing Wisely, low-value, overuse, etc.) is unique to the English language and may not translate well across other languages. Reference lists of included studies were hand searched to identify additional citations and suggestions were provided from experts in the field.

### ***3.3.3 Article Eligibility and Selection***

Studies were eligible for inclusion in the systematic review if they: 1) were written in English; 2) described an intervention that included patients in their aim to reduce the use

of a low-value test or treatment; and 3) reported the use of low-value care with and without the intervention. Studies were excluded if they reported an intervention to reduce low-value care that solely targeted care providers or if the low-value practice of interest was not a medical test or treatment (e.g., bed rest, use of physical restraints). For the meta-analysis, studies were included if they measured the use of low-value care as the proportion of patients that received the low-value practice with and without exposure to the intervention. Citations were screened for inclusion in two phases. Prior to screening, the citation screening form was pilot tested using a random sample of 50 citations and refined until agreement was consistent ( $k > 0.8$ ). In Phase 1, two investigators (EES and CD) screened each citation by title and abstract to determine potential eligibility for the review. Potentially relevant citations entered into Phase 2 screening where two investigators (EES and LWB) screened full-text versions of each citation to determine eligibility for inclusion. The kappa statistic was used to quantify agreement during each stage of screening.<sup>61</sup>

### ***3.3.4 Data Extraction and Risk of Bias Assessment***

Data extraction was conducted in duplicate by three investigators (EES, CD, LWB) in DistillerSR (Evidence Partners, Ottawa, Canada). Our data extraction form was pilot tested using six randomly-selected citations. Extracted data included study characteristics (e.g., study design, country of origin), characteristics of the low-value practice (e.g., test or treatment), components of the intervention (e.g., strategy for patient engagement, clinical setting), and outcomes (e.g., proportion of patients receiving low-value care).

Risk of bias assessment was conducted in duplicate by two investigators (EES and LWB) using the Cochrane Risk of Bias Tool<sup>218</sup> for randomized clinical trials (RCTs) and a modified version of the Downs and Black checklist for non-randomized studies.<sup>219</sup> For randomized studies, summary assessments did not consider the ‘Performance Bias’ domain, as participants were unable to be blinded due to the behavioural nature of the interventions. The Downs and Black checklist was modified by removing questions pertaining to randomization and those that did not apply to uncontrolled studies. Question 27 was modified to “Did the authors conduct a power calculation? 1=Yes, 0=No.” Due to these modifications, the checklist was scored out of 23, 24, or 25 depending on the design of the study. The percentage of the total possible score was calculated for each study to facilitate between-study comparisons. Studies were dichotomized into two categories, which were determined by calculating the median percentage score and assigning scores below the median to the ‘low quality’ category and assigning scores above the median to ‘moderate quality’ category.

### ***3.3.5 Synthesis***

For the meta-analysis, the primary outcome was the proportion of patients who received a low-value practice. Individual estimates of the primary outcome from each study were pooled using the random effects model of Der Simonian and Laird and reported as a risk ratio. Publication bias was assessed through examination of the funnel plot and results from Egger’s test. Heterogeneity was assessed using the  $I^2$  statistic<sup>220</sup> and Cochrane Q test. Explanations for heterogeneity were sought through stratified analyses and meta-regression. Pre-specified subgroups included study-design (RCTs vs. non-randomized),



type of low-value care (test vs. treatment), and risk of bias (low vs. high/unclear).

Analyses were conducted using the metan series of commands in Stata version 14

(StataCorp, Texas, USA), and statistical significance was set as  $p < 0.05$ .

## **3.4 Results**

### ***3.4.1 Study Selection***

Database and grey literature searches yielded 5,459 unique citations, from which the full text of 151 were reviewed in detail and 18 were included in the systematic review. The most common reason for exclusion after full text review was lack of reported use of the low-value practice with and without the intervention (Figure 3.1). Of the 18 studies included, 12 were eligible for inclusion in the meta-analysis because they reported the change in use of the low-value practice as the proportion of patients who received the low-value practice.

### ***3.4.2 Study Characteristics***

Characteristics of included studies are described in Table 3.2. The majority of studies originated from the United States (n=10, 56%), United Kingdom (n=4, 22%) and Canada (n=2, 11%) and were published prior to 2010 (n=12, 67%). Eight studies were RCTs, and 10 were non-randomized intervention studies. The most common type of low-value care was a medical treatment deemed low-value owing to lack of efficacy (n=9, 50%). Most studies took place in primary care settings (n=10, 56%), hospital in-patient wards (n=3, 17%), or the emergency department (n=3, 17%). Six studies (33%) focused on pediatric patients and their caregivers, four studies (22%) targeted adult patients, and one study

(6%) targeted geriatric patients. The strategies for patient engagement employed within the interventions included patient-oriented educational materials (n=14, 78%), shared decision-making (n=5, 28%), and media campaigns (n=4, 22%). Three studies (17%) reported involving patients or members of the public in the development of materials (e.g., shared decision-making tool, waiting room posters) used in the intervention.

### ***3.4.3 Patient-targeted Interventions and Use of Low-value Care***

Of the 18 included studies, 15 (83.3%) reported a statistically significant decrease in the use of the targeted low-value practice (Table 3.2).

Low-value diagnostic tests were the target of three studies;<sup>72,101,112</sup> one study aimed to reduce computed tomography (CT) scans for mild head injury in children<sup>101</sup> and two studies aimed to reduce cardiac stress testing in adults at low risk for acute coronary syndrome.<sup>72,112</sup> All three studies took place within an emergency department, and employed a shared decision-making intervention. In addition, two of the studies included educational materials for patients to inform them of risks and care options.<sup>72,112</sup>

Low-value treatments were the target of 15 studies, of which 12 targeted medications and three targeted procedures. Antibiotic use was the target low-value treatment in 10 studies, of which five focused on children,<sup>90,103,145,174,221</sup> one focused on adults,<sup>127</sup> and four had no age restriction.<sup>100,107,123,184</sup> Media campaigns were used to share information about low-value antibiotic use in four studies<sup>100,107,145,221</sup> and were supplemented with educational materials for patients or caregivers in two studies.<sup>100,145</sup> All four studies that employed

media campaigns reported a significant reduction in antibiotic use. Other studies targeting antibiotic use engaged the public through educational materials (n=4),<sup>90,127,174,184</sup> shared decision-making (n=1),<sup>123</sup> or a combination of education and shared decision-making (n=1).<sup>103</sup> All but one<sup>174</sup> of these studies reported decreases in the proportion of patients using antibiotics ranging from 15% to 25%. In one of these studies, antibiotic use was reduced in adults (absolute difference 24%, P<0.02), but not in children (absolute difference 4%, P=0.18).<sup>184</sup> Other low-value treatments that were targeted included non-indicated caesarean sections,<sup>133</sup> elective labour induction<sup>157</sup> and non-beneficial life-sustaining treatments in the intensive care unit (Table 3.2).<sup>153</sup>

Twelve studies were included in the meta-analysis, of which three focused on reducing low-value tests and nine focused on low-value treatments. Pooling data from these studies suggested that patient-targeted interventions decreased use of the targeted low-value practice (RR 0.72; 95% CI 0.63-0.83; I<sup>2</sup> 84.5%) (Figure 3.2). This effect was significant in both RCTs (n=7) (RR 0.75; 95% CI 0.66-0.84) and non-randomized intervention studies (n=5) (RR 0.68; 95% CI 0.48-0.98) (Figure 3.2). Egger's test (P=0.261) and assessment of the funnel plot (Figure 3.3) for asymmetry indicated a lack of publication bias.

### **3.4.4 Quality Assessment**

#### **3.4.4.1 Randomized Clinical Trials**

Of the 8 randomized studies included in the review, 5 were assigned an overall low risk of bias<sup>72,103,112,123,161</sup> and 3 had an overall unclear risk of bias<sup>127,133,153</sup> (Table 3.3). All but

one study had a low risk of selection bias as they reported adequate methods for random sequence generation, and all studies had a low risk of attrition bias. The reporting bias domain was unclear in two studies.

#### *3.4.4.2 Non-randomized studies*

Of the 10 non-randomized studies, five were classified as low quality and five were classified as moderate quality (Table 3.4). All non-randomized studies clearly reported objectives and interventions, however confounding variables were poorly reported (n=3, 30% partially described, n=1, 10% fully described). With respect to external validity, 6 studies (60%) aimed to recruit participants that were representative of the source population and 9 (90%) used staff, places, and facilities that were representative of the treatment received by the majority of patients. None of the studies provided enough information to determine whether participants were representative of the population from which they were recruited. Regarding internal validity, none of the studies blinded participants or outcome assessors. Most studies did not report the number of patients lost to follow-up (n=6, 60%) and only 4 (40%) studies conducted a power calculation. Adequate adjustment for confounding was conducted in three studies (30%). Overall percentage scores ranged from 50% to 78% of the possible total.

#### *3.4.5 Exploration for Sources of Heterogeneity*

Stratified analyses were conducted to explore heterogeneity. When stratified by the type of low-value care, the effect was non-significant among studies targeting low-value tests (n=3) (RR 0.63; 95% CI 0.40-1.00; I<sup>2</sup> 95.2%) and was significant among studies targeting

low-value treatments (n=9) (RR 0.74; 95%CI 0.64-0.86; I<sup>2</sup> 79.4%) (Figure 3.4).

Stratification by the strategy for patient involvement showed that both shared decision-making (RR 0.58; 95%CI 0.41-0.82; I<sup>2</sup> 92.8%) and patient-oriented educational materials (RR 0.81; 95%CI 0.71-0.92; I<sup>2</sup> 72.8%) (Figure 3.5) significantly reduced the use of low-value care. Meta-regression suggested that neither variability in the targeted low-value practice (i.e., test vs. treatment) nor in the strategy for patient engagement (i.e., shared decision-making vs. patient-oriented educational materials) contributed to inter-study heterogeneity (Table 3.5). When the meta-analysis was restricted to RCTs with low-risk of bias (n=5), the effect of patient-targeted interventions remained significant (RR 0.69; 95%CI 0.58-0.83) although there was still a high degree of heterogeneity (I<sup>2</sup> 81.7%; Q-statistic p=0.000) (Figure 3.6). These studies included heterogeneous strategies for public engagement and heterogeneous low-value practices; four studies used shared decision-making, whereas one used patient-targeted educational materials and three studies targeted medications, whereas two targeted diagnostic tests.

### **3.5 Discussion**

We identified 18 studies that prospectively engaged patients in interventions to reduce low-value care, among which eight studies were RCTs. Commonly tested strategies included patient-oriented educational materials, shared decision-making, and mass media campaigns. There was variability across the included studies with respect to the targeted patient population, the type of low-value care, and the clinical setting, however the most common clinical context involved adult patients in primary care practices making decisions about treatments such as antibiotics. Pooled data from the included studies

demonstrated that patient-targeted de-implementation interventions reduced the risk of receiving low-value care by an average of 28% (range 17% - 37%) with consistent findings across different study designs and patient-engagement strategies.

Reducing the use of low-value care in clinical practice has primarily been addressed through interventions targeted at clinicians. Strategies such as clinical decision support, clinical guidelines and clinician education have produced inconsistent results in the reduction of low-value care.<sup>51,222</sup> Clinicians have indicated that important barriers to reducing low-value care are patient expectations and the risk of patient dissatisfaction if expectations are not met.<sup>26,223</sup> In response, initiatives such as the Choosing Wisely campaign have focused on raising public awareness of low-value care and encouraging patients to discuss the value of tests and treatments with their clinicians.<sup>42,48</sup> The results of our work show that this switch in focus is likely to be beneficial as we found consistent decreases in low-value care within the patient-focused interventions.

We identified shared decision-making and patient-oriented educational materials to be effective strategies for involving patients. Shared decision-making involves both the patient and provider jointly making a care decision that incorporates both the patient's preferences and values and best evidence.<sup>71</sup> Educational materials may be used to facilitate this process by providing patients with information on risks, benefits, and personalized outcome probabilities.<sup>69</sup> We identified interventions where patient-oriented educational materials, including decision aids, were incorporated into studies to facilitate the shared decision-making process and interventions where patient-oriented educational

materials were used on their own, with both demonstrating a reduction in use of the targeted low-value practice.

Patient-targeted interventions should be tailored to the context in which they occur. In this review, the majority of interventions occurred in a primary care setting and targeted low-value practices that lacked efficacy, such as unnecessary antibiotic use, by providing patients with educational materials. Overall this was an effective strategy in this context, which involved a low-value practice associated with minimal risk and a low acuity clinical encounter. In contrast, low-value practices that may cause harm to patients or clinical encounters with higher acuity (e.g., intensive care unit) may require a stronger patient-engagement strategy; one study in our review achieved this by involving families and caregivers in ethics consultations to discuss non-beneficial life sustaining treatments.<sup>153</sup> Another factor to consider is the demand-side stakeholder who will be engaged in the intervention. For example, one study found the use of patient-oriented educational materials to reduce antibiotic use to be successful among adult patients but not among pediatric patients.<sup>184</sup> This finding highlights the need to tailor interventions to the recipient. For example, the best way to engage a patient may differ than that of a caregiver or surrogate decision maker. Collectively, the variability of these factors (i.e., risk associated with the low-value practice, severity of the clinical situation, target stakeholder) across studies in the meta-analysis is likely the reason for the observed heterogeneity. In future work, tailoring the strategy for patient involvement to address these complex factors may be achieved by involving stakeholders, including clinicians and patients and families with lived experience, in the planning of de-implementation

interventions. Engaging these stakeholders early in research and practice change processes could provide insight into the type of patient engagement strategy that would be most well-received and have the greatest impact on reducing the use of the low-value care.

### ***3.5.1 Strengths and Limitations***

The strengths of this study include a peer-reviewed search strategy and the inclusion of various types of low-value care (i.e., potentially harmful, lack of efficacy). In addition, the meta-analysis provides a quantification of potential effect sizes suggesting a 17% to 37% relative reduction in the use of low-value care while highlighting important heterogeneity. However, this needs to be interpreted within the context of limitations. First, the restriction of the database search to the English language may have led to the omission of relevant articles. Second, the assessment of risk of bias using the Cochrane tool and Downs and Black checklist is subjective. Certain aspects of these tools are not immediately applicable to behaviour-change interventions (e.g., blinding of participants). We addressed these challenges by ensuring that quality assessment was conducted by two reviewers independently and in duplicate with any disagreements settled by a third reviewer and modifying the tools as necessary. Third, the main outcome of interest was the proportion of patients who received the low-value practice of interest. This outcome may overestimate the use of certain low-value practices depending on how they were reported. For example, if a study's outcome was the number of patients given a prescription for antibiotics, there is a possibility that the patient ended up not using the antibiotics prescribed. However, this potential misclassification bias would be non-



differential and would therefore suggest that our results are a conservative estimate of the treatment effects observed. Fourth, the majority of included studies targeted antibiotic use in primary care settings. Further research is needed to examine the impact of patient-targeted interventions for other low-value care practices (e.g., diagnostic imaging) in other clinical settings (e.g., emergency department). Finally, the significant findings from included RCTs demonstrate the efficacy of patient-targeted interventions to reduce low-value care, however they do not provide an indication of their effectiveness in a real-world context.

### **3.6 Conclusions**

This systematic review and meta-analysis reports that patient-targeted interventions decrease the use of low-value care. Patient-oriented educational materials, shared decision-making, and media campaigns are useful strategies for engaging patients. Clinicians and policymakers should consider including a patient-targeted intervention in their initiatives to reduce low-value care.

**Table 3.1 MEDLINE (Ovid) Search Strategy**

| #  | Searches  |
|----|---|
| 1  | health services misuse/ or medical overuse/   |
| 2  | Unnecessary Procedures/   |
| 3  | ((misuse* or overuse* or unnecessary or ineffective or overtreat* or overdiagnos* or overutilis* or overutiliz* or low-value or waste*) adj5 (health or healthcare or care or procedure* or intervention* or test* or treatment*)).tw,kf.   |
| 4  | ((abandon* or contradict* or refute* or refuting or reassess* or re-assess* or obsole* or revers* or delist* or de-list* or disinvest* or dis-invest* or discontinu* or dis-contin* or decommission* or de-commission* or deadopt* or de-adopt* or de-implement* or deimplement*) adj5 (medical or health or healthcare or policy or procedure* or intervention*)).tw,kf. |
| 5  | 1 or 2 or 3 or 4  |
| 6  | patient participation/ or community participation/  |
| 7  | patient satisfaction/ or patient preference/  |
| 8  | ((patient* or family* or families or public or citizen* or consumer*) adj5 (perception* or engag* or involv* or participat* or decision* or interaction* or role* or aware* or conversation* or responsibilit* or discuss*)).tw,kf.   |
| 9  | 6 or 7 or 8   |
| 10 | 5 and 9   |
| 11 | choosing wisely.mp.   |
| 12 | 10 or 11  |
| 13 | Limit 12 to English language  |

**Table 3.2 Characteristics of included studies (n=18)**

| <b>Author (year)</b>              | <b>Country</b> | <b>Design</b> | <b>No. of patients included</b> | <b>Low-value practice (Clinical setting)</b>                      | <b>Intervention</b>  | <b>Control</b>   | <b>Use of low-value practice without intervention</b>       | <b>Use of low-value practice with intervention</b>          | <b>Change in use of the low-value practice</b> |
|-----------------------------------|----------------|---------------|---------------------------------|---|--|--|---|---|--|
| <b>Randomized clinical trials</b> |                |               |                                 |   |  |  |   |   |  |
| Macfarlane (2002)                 | United Kingdom | Nested        | 212                             | Antibiotics for acute bronchitis (Primary Care)                   | Information leaflet on the natural course of lower respiratory symptoms and the advantage and disadvantages of antibiotics | General practitioner provided prompt card for informing patients that there is no indication for antibiotics | Proportion of patients who used antibiotics: 62%            | Proportion of patients who used antibiotics: 47%            | RR: 0.76; 95%CI: (0.59-0.97)                   |
| Francis (2009)                    | United Kingdom | Cluster       | 558                             | Antibiotic prescribing (Primary Care)                             | Interactive booklet on respiratory tract infections  | Usual care   | Proportion of patients prescribed antibiotics: 40.8%        | Proportion of patients prescribed antibiotics: 19.5%        | RR: 0.48; 95%CI: (0.36, 0.64)                  |
| Legare (2012)                     | Canada         | Cluster       | 181                             | Antibiotics for acute respiratory tract infections (Primary Care) | Shared decision-making between patient and physicians  | Usual care   | Patients who used antibiotics following consultation: 52.2% | Patients who used antibiotics following consultation: 27.2% | RR: 0.53; 95%CI: (0.40, 0.70)                  |

| Author (year)       | Country       | Design       | No. of patients included | Low-value practice (Clinical setting)  | Intervention   | Control    | Use of low-value practice without intervention                   | Use of low-value practice with intervention                       | Change in use of the low-value practice |
|---------------------|---------------|--------------|--------------------------|--|--|------------|--|---|---|
| Tannenbaum (2014)   | Canada        | Cluster      | 303                      | Benzodiazepines for older adults (Community pharmacy)                          | Booklet providing information about risks, a tapering protocol, and prompt to discuss with physician | Usual care | Proportion of patients who discontinued benzodiazepine use: 4.5% | Proportion of patients who discontinued benzodiazepine use: 27.0% | RR: 0.76; 95%CI: (0.69, 0.85)           |
| Schneiderman (2003) | United States | Multi-center | 551                      | Nonbeneficial life-sustaining treatments in the intensive care unit (Hospital) | Ethics consultations   | Usual care | Mean (SD) days receiving ventilation: 8.22 (11.16)               | Mean (SD) days receiving ventilation: 6.52 (8.52)                 | Absolute Difference: 1.7 days; $P=0.03$ |

| Author (year)     | Country        | Design              | No. of patients included | Low-value practice (Clinical setting)   | Intervention   | Control    | Use of low-value practice without intervention                                     | Use of low-value practice with intervention  | Change in use of the low-value practice  |
|-------------------|----------------|---------------------|--------------------------|---|--|------------|--|--|--|
| Montgomery (2007) | United Kingdom | Three-armed         | 742                      | Non-indicated caesarean section (Hospital)  | <i>Information program:</i> Information about probabilities of clinical outcomes<br><br><i>Decision analysis:</i> Decision tree recommended a 'preferred option' based on women's preferences and values | Usual care | Proportion of elective caesarean sections: 50%                                     | Proportion of elective caesarean sections, <i>Information program:</i> 49%,<br><br><i>Decision analysis:</i> 41% | <i>Information program:</i> RR: 0.95; 95%CI: (0.79, 1.14)<br><br><i>Decision analysis:</i> RR: 0.80; 95%CI: (0.66, 0.98) |
| Hess (2012)       | United States  | Two-armed, parallel | 204                      | Cardiac stress testing in patients at low risk for acute coronary syndrome (Emergency Department) | Decision aid to improve patient knowledge and engage in shared decision making   | Usual care | Proportion of patients who received stress testing within 30 days of ED visit: 91% | Proportion of patients who received stress testing within 30 days of ED visit: 75%                               | RR: 0.81; 95%CI: (0.72, 0.93)  |

| Author (year)                              | Country       | Design                          | No. of patients included | Low-value practice (Clinical setting)   | Intervention   | Control          | Use of low-value practice without intervention                                       | Use of low-value practice with intervention  | Change in use of the low-value practice                  |
|--|---------------|---------------------------------|--------------------------|---|--|------------------|--|--|--|
| Hess (2016)                                | United States | Multi-center                    | 898                      | Cardiac stress testing in patients at low risk for acute coronary syndrome (Emergency Department) | Inform patients about their risk and options for care; shared decision aid | Usual care       | Proportion of patients who received stress testing within 30 days of ED visit: 45.6% | Proportion of patients who received stress testing within 30 days of ED visit: 38.1% | RR: 0.84; 95%CI: (0.72, 0.98)                            |
| <i>Non-randomized intervention studies</i> |               |                                 |                          |   |  |                  |  |  |  |
| Wheeler (2001)                             | United States | Prospective observational study | 144                      | Antibiotic overuse (Primary Care)   | Educational videotape & written materials                                  | No control group | Proportion of patients receiving antibiotic prescriptions: 6.8%                      | Proportion of patients receiving antibiotic prescriptions: 4.2%                      | RR: 0.62; 95%CI: (0.15, 2.49)                            |
| Perz (2002)                                | United States | Before-and-after                | NR                       | Antibiotic overuse (Primary Care)   | Educational materials for parents of young children and the general public | Usual care       | Antibiotic prescription rate per 100-person years (% change): 139 (-8%)              | Antibiotic prescription rate per 100-person years (% change): 144 (19%)              | Intervention-attributable decline: 11%; (95% CI: 8%-14%) |

| Author (year)   | Country       | Design                          | No. of patients included | Low-value practice (Clinical setting)  | Intervention  | Control                         | Use of low-value practice without intervention                                      | Use of low-value practice with intervention   | Change in use of the low-value practice  |
|-----------------|---------------|---------------------------------|--------------------------|--|---|---------------------------------|---|---|--|
| Dollman (2005)  | Australia     | Before-and-after                | ~20 000                  | Antibiotic use for upper respiratory tract infections, sinusitis and otitis media (Primary Care)       | Pamphlets highlighting risks and benefits distributed to general practices and within the community | No control group                | Defined daily dosages per 1000 population per day: 77.1                             | Defined daily dosages per 1000 population per day: 52.9                             | Overall reduction: 32%; $P < 0.01$   |
| Gonzales (2005) | United States | Non-randomized controlled trial | 1144                     | Antibiotics for children with pharyngitis, antibiotics for adults with acute bronchitis (Primary Care) | Educational materials mailed to households and available in physicians' offices                     | Usual care                      | Proportion of patients prescribed antibiotics: <i>Adult</i> -60%, <i>Child</i> -34% | Proportion of patients prescribed antibiotics: <i>Adult</i> -36%, <i>Child</i> -30% | <i>Child</i> -RR: 0.60; 95%CI: (0.51, 0.70)<br><i>Adult</i> -RR: 0.88; 95%CI: (0.65, 1.18) |
| Ashe (2006)     | United States | Before-and-after                | 720                      | Antibiotic overuse   | Educational waiting room poster in physicians' offices  | Historical controls; usual care | Proportion of patients treated with antibiotics: 44.3%                              | Proportion of patients treated with antibiotics: 48.3%                              | RR: 1.09; 95%CI: (0.91, 1.31)  |

| Author (year)   | Country        | Design                          | No. of patients included | Low-value practice (Clinical setting)   | Intervention   | Control  | Use of low-value practice without intervention  | Use of low-value practice with intervention  | Change in use of the low-value practice  |
|-----------------|----------------|---------------------------------|--------------------------|---|--|--|---|--|--|
| Gonzales (2008) | United States  | Non-randomized controlled trial | 992                      | Antibiotic overuse (Primary Care)   | Media campaign   | Counties that did not receive a media campaign | Net antibiotic prescriptions per 1000 persons compared to control community (10 months pre-intervention): -1  | Net antibiotic prescriptions per 1000 persons compared to comparison community (12 months post-intervention): -5   | 8.8% net decrease in managed care-associated antibiotic dispenses per 1000 members; $P=0.03$ |
| Hemo (2009)     | Israel         | Prospective observational study | 84 979                   | Antibiotic use for upper respiratory tract infection, otitis media, pharyngitis (Not specified) | Media campaign   | No control group                               | Pre-campaign period vs. baseline:<br><i>URI OR:</i> 0.962 (0.891, 1.039);<br><i>Otitis media OR:</i> 0.970 (0.874, 1.076);<br><i>Pharyngitis OR:</i> 0.968 (0.929, 1.009) | Post-campaign period vs. baseline:<br><i>URI OR:</i> 0.749 (0.694, 0.808);<br><i>Otitis media OR:</i> 0.652 (0.591, 0.718);<br><i>Pharyngitis OR:</i> 0.931 (0.890, 0.973) |  |
| Morgan (2002)   | United Kingdom | Before-and-after                | 242                      | Long term use of benzodiazepines (Primary Care)   | Patient letter explaining risks, encouraging a reduction in intake, and prompt to contact physician for discussion | No control group                               | Mean defined daily dosages/patient: 336.6   | Mean defined daily dosages /patient: 283.0   | Absolute Difference: 53.6; $P<0.001$   |



| Author (year)   | Country       | Design           | No. of patients included | Low-value practice (Clinical setting)                           | Intervention  | Control                | Use of low-value practice without intervention                     | Use of low-value practice with intervention                   | Change in use of the low-value practice |
|-----------------|---------------|------------------|--------------------------|---|---|------------------------|--|---|---|
| Simpson (2010)  | United States | Before-and-after | 531                      | Elective labor induction (Hospital)                             | Educational classes on elective induction risk  | No educational classes | Proportion of patients who received elective induction: 37%        | Proportion of patients who received elective induction: 27.9% | RR: 0.75; 95%CI: (0.58, 0.96)           |
| Engineer (2018) | United States | QI project       | 176                      | Computed tomography for mild head injury (Emergency Department) | Clinical decision support tool that involved a structured discussion between providers and caregivers | No control group       | Baseline head CT utilization in the pediatric ED population: 62.7% | Proportion of patients who received head CT: 22.0%            | RR: 0.35; 95%CI: (0.26, 0.47)           |

QI: Quality Improvement, ED: Emergency Department

**Table 3.3 Risk of bias and quality assessment of included randomized clinical trials**

| <b>Study (year)</b> | <b>Selection bias (Random sequence generation)</b> | <b>Selection bias (Allocation concealment)</b> | <b>Performance bias (Blinding of participants and personnel)</b> | <b>Detection bias (Blinding of outcome assessment)</b> | <b>Attrition bias (Incomplete outcome data)</b> | <b>Reporting bias (Selective reporting)</b> | <b>Other bias</b> | <b>Summary assessment</b> |
|---------------------|--|--|--|--|---|---|-------------------|---------------------------|
| Hess (2012)         | Low risk of bias                                   | Low risk of bias                               | High risk of bias  | Low risk of bias                                       | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Low risk of bias          |
| Macfarlane (2002)   | Unclear risk of bias                               | Low risk of bias                               | Low risk of bias   | Low risk of bias                                       | Low risk of bias                                | Unclear risk of bias                        | Low risk of bias  | Unclear risk of bias      |
| Tannenbaum (2014)   | Low risk of bias                                   | Low risk of bias                               | Low risk of bias   | Low risk of bias                                       | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Low risk of bias          |
| Francis (2009)      | Low risk of bias                                   | Low risk of bias                               | Low risk of bias   | Low risk of bias                                       | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Low risk of bias          |
| Schneiderman (2003) | Low risk of bias                                   | Low risk of bias                               | Low risk of bias   | Low risk of bias                                       | Low risk of bias                                | Unclear risk of bias                        | Low risk of bias  | Unclear risk of bias      |
| Legare (2012)       | Low risk of bias                                   | Low risk of bias                               | High risk of bias  | Low risk of bias                                       | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Low risk of bias          |
| Montgomery (2007)   | Low risk of bias                                   | Low risk of bias                               | High risk of bias  | Unclear risk of bias                                   | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Unclear risk of bias      |
| Hess (2016)         | Low risk of bias                                   | Low risk of bias                               | High risk of bias  | Low risk of bias                                       | Low risk of bias                                | Low risk of bias                            | Low risk of bias  | Low risk of bias          |

**Table 3.4 Quality assessment for non-randomized interventions using the Downs & Black tool (n=10)**

| Checklist Item | Engineer | Hemo | Morgan | Ashe | Dollman | Wheeler | Perz | Simpson | Gonzales | Gonzales |
|----------------|----------|------|--------|------|---------|---------|------|---------|----------|----------|
| Q1             | 1        | 1    | 1      | 1    | 1       | 1       | 1    | 1       | 1        | 1        |
| Q2             | 1        | 1    | 1      | 1    | 1       | 1       | 1    | 1       | 0        | 1        |
| Q3             | 1        | 1    | 1      | 1    | 0       | 1       | 1    | 1       | 1        | 0        |
| Q4             | 1        | 1    | 1      | 1    | 1       | 1       | 1    | 1       | 1        | 1        |
| Q5             | 0        | 1    | 0      | 0    | 0       | 1       | 2    | 0       | 1        | 0        |
| Q6             | 1        | 0    | 1      | 1    | 1       | 1       | 1    | 1       | 0        | 1        |
| Q7             | 1        | 1    | 1      | 0    | 0       | 1       | 1    | 0       | 1        | 0        |
| Q8             | 0        | n/a  | n/a    | n/a  | n/a     | n/a     | n/a  | 0       | 1        | n/a      |
| Q9             | n/a      | n/a  | n/a    | n/a  | n/a     | n/a     | n/a  | 0       | 0        | 1        |
| Q10            | 0        | 1    | 0      | 1    | 1       | 0       | 1    | 1       | 1        | 1        |
| Q11            | UTD      | 1    | 1      | 1    | 1       | 1       | 1    | 0       | 0        | UTD      |
| Q12            | UTD      | UTD  | UTD    | UTD  | UTD     | UTD     | UTD  | UTD     | UTD      | UTD      |
| Q13            | 1        | 1    | 1      | 1    | 1       | 1       | 1    | 0       | 1        | 1        |
| Q14            | 0        | 0    | 0      | 0    | 0       | 0       | 0    | 0       | 0        | 0        |
| Q15            | 0        | 0    | 0      | 0    | 0       | 0       | 0    | 0       | 0        | 0        |
| Q16            | 1        | 1    | 1      | 1    | 1       | 1       | 1    | 1       | 1        | 1        |
| Q17            | 1        | 1    | 1      | 1    | 1       | 1       | 1    | UTD     | 1        | UTD      |
| Q18            | 1        | 1    | 1      | 1    | 0       | 1       | 1    | 1       | 1        | 1        |
| Q19            | 1        | 1    | 1      | 1    | 1       | 0       | UTD  | UTD     | 0        | UTD      |
| Q20            | 1        | 1    | 0      | 1    | 0       | 1       | 1    | 1       | 1        | 1        |

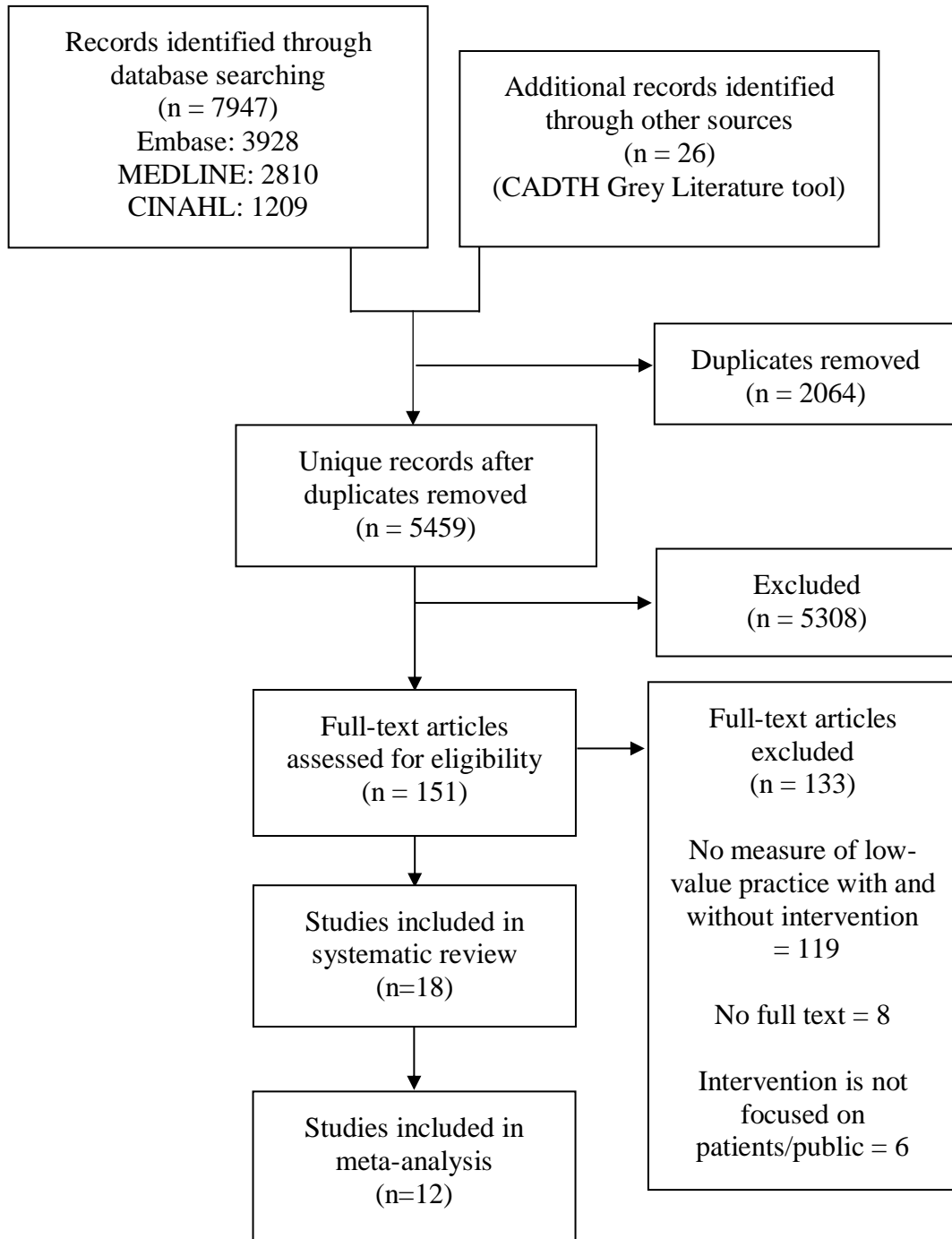
| <b>Checklist Item</b>  | <b>Engineer</b> | <b>Hemo</b> | <b>Morgan</b> | <b>Ashe</b> | <b>Dollman</b> | <b>Wheeler</b> | <b>Perz</b> | <b>Simpson</b> | <b>Gonzales</b> | <b>Gonzales</b> |
|------------------------|-----------------|-------------|---------------|-------------|----------------|----------------|-------------|----------------|-----------------|-----------------|
| <b>Q21</b>             | 0               | 1           | 1             | 1           | 1              | 1              | 1           | 1              | 1               | 0               |
| <b>Q22</b>             | n/a             | n/a         | n/a           | n/a         | n/a            | n/a            | 1           | UTD            | 1               | 1               |
| <b>Q25</b>             | 0               | 1           | 0             | 0           | 0              | UTD            | 1           | 0              | 0               | 1               |
| <b>Q26</b>             | UTD             | 1           | UTD           | 0           | UTD            | 0              | UTD         | UTD            | UTD             | 1               |
| <b>Q27</b>             | 0               | 0           | 0             | 1           | 0              | 1              | 0           | 1              | 0               | 1               |
| <b>Total</b>           | 12/23           | 17/22       | 13/22         | 15/22       | 11/22          | 15/22          | 18/23       | 11/25          | 14/25           | 14/24           |
| <b>% Score</b>         | 52%             | 77%         | 59%           | 68%         | 50%            | 68%            | 78%         | 44%            | 56%             | 58%             |
| <b>Overall quality</b> | Low             | Moderate    | Moderate      | Moderate    | Low            | Moderate       | Moderate    | Low            | Low             | Low             |

n/a: not applicable; UTD: unable to determine

**Table 3.5 Results from meta-regression analysis**

| <b>Variable</b>                 | <b>Coefficient of logRR(s.e.)</b> | <b><i>P</i> value</b> |
|---------------------------------|-----------------------------------|-----------------------|
| Low-value practice              | .144 (.197)                       | 0.478                 |
| Strategy for patient engagement | .313 (.152)                       | 0.061                 |

**Figure 3.1 Selection of articles included in the review**



**Figure 3.2 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices by study design**

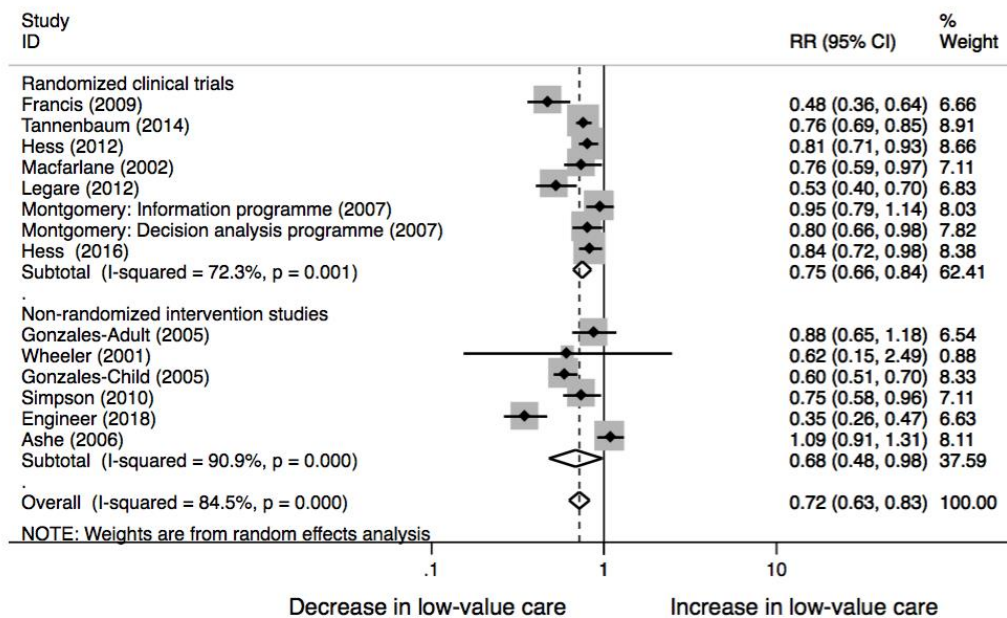
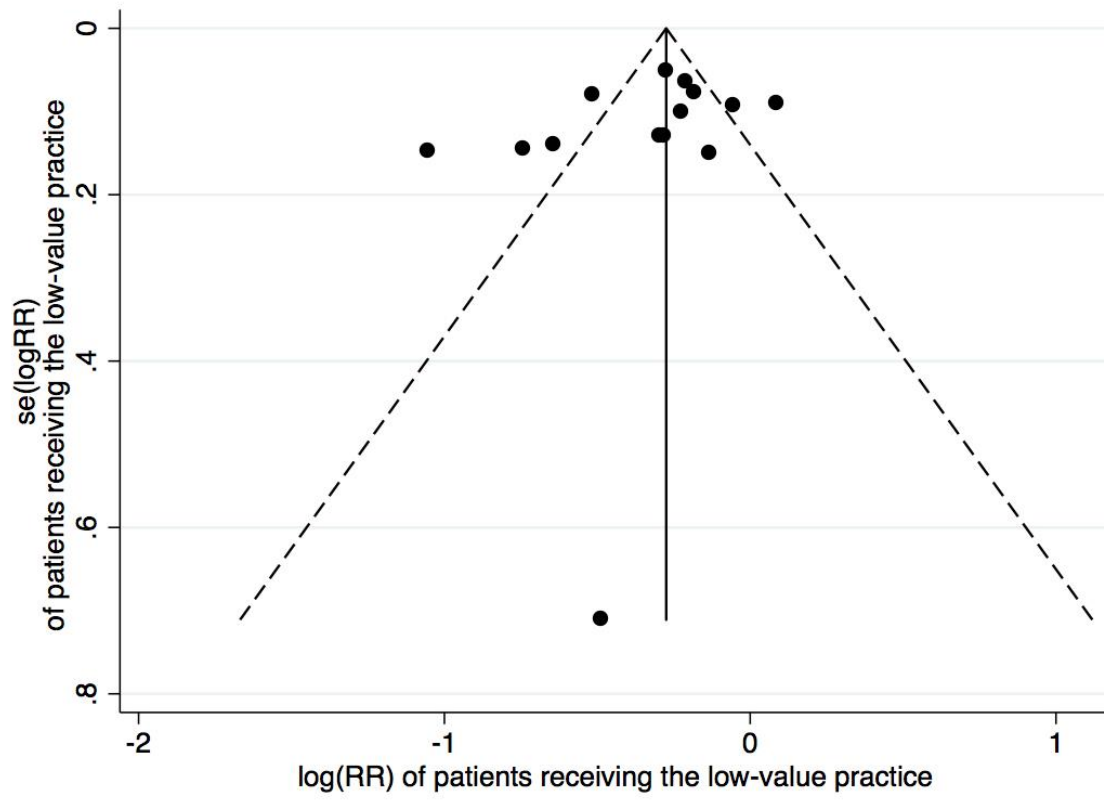


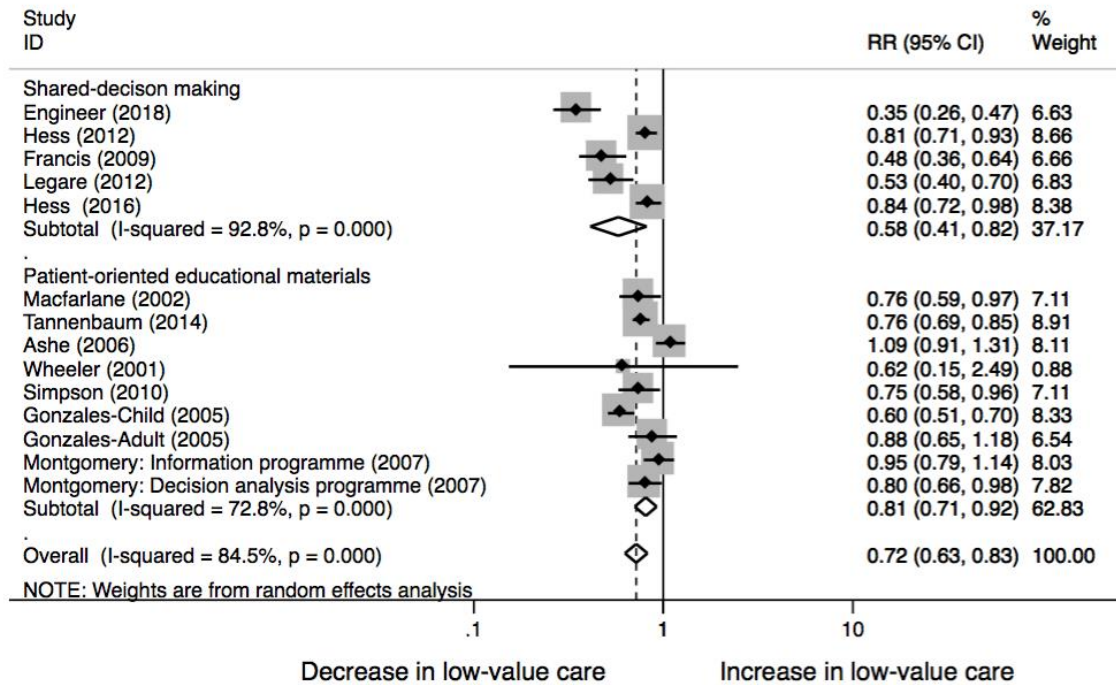
Figure 3.3 Funnel plot with pseudo 95% CIs



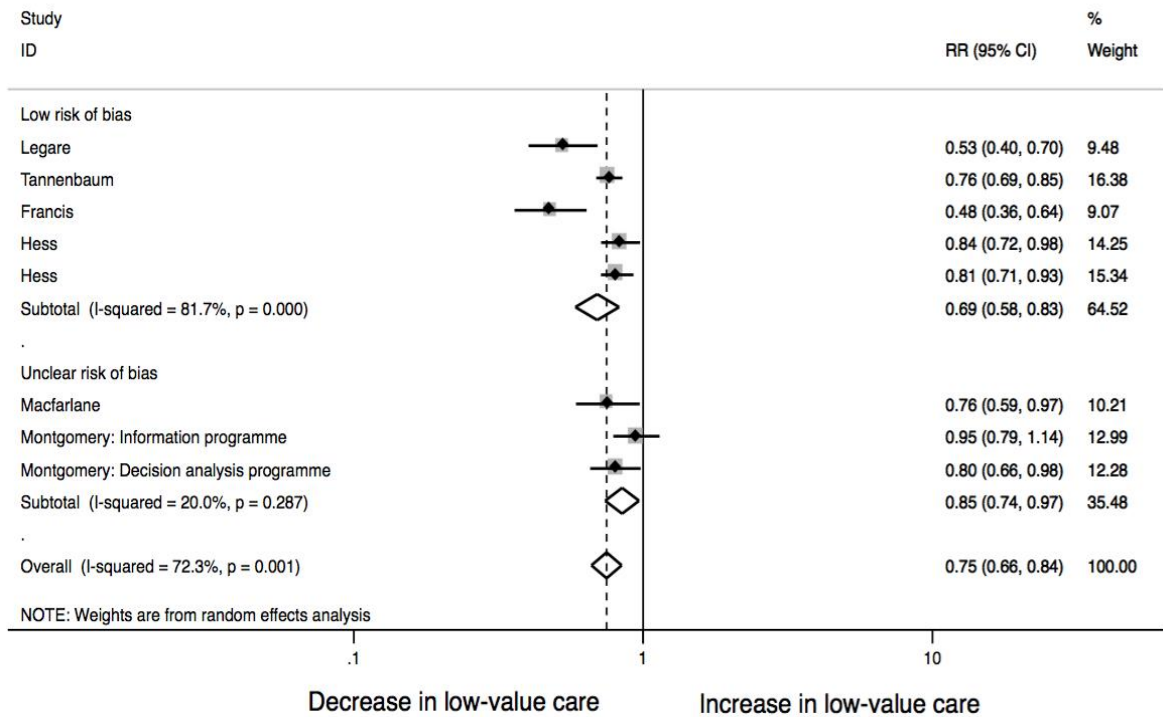




**Figure 3.5 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices by the strategy for patient involvement**



**Figure 3.6 Random-effects meta-analysis of the association between patient-targeted interventions to reduce low-value care and the use of low-value practices in RCTs, by summary risk of bias assessment**



## **CHAPTER FOUR: CONCLUSIONS**

#### **4.1 The state of the literature on public involvement in reducing low-value care**

A systematic and comprehensive search of the literature pertaining to public involvement in reducing low-value care has revealed a significant collection of original and non-original research surrounding this timely concept. The distribution of the year of publication follows a pattern that is similar to the literature on reducing low-value care in general<sup>45</sup> and suggests that the Choosing Wisely campaign may have catalyzed the acknowledgement of and interest in the role of the public in reducing low-value care.<sup>48</sup> Approximately one third of the included citations were non-original research describing or suggesting ways to involve the public. Among these were a number of editorial pieces and narrative reviews, such as in the ‘Right Care’ series published in Lancet that included a discussion about members of the public being key stakeholders in the initiative to maximize value in healthcare.<sup>37</sup> The original research included studies that proposed a strategy for public involvement, studies that tested the effectiveness of strategies for public involvement, and studies that explored stakeholder’s perspectives about public involvement. These studies provide examples of strategies, evidence of their impact, and support for their use, respectively. However, the studies that evaluated the effectiveness of strategies and explored stakeholders’ perspectives were few in number with little variation in contextual factors such as clinical setting or country. Collectively, the body of literature identified from this research demonstrates a growing interest in involving the public in initiatives to reduce low-value care and provides examples of strategies by which they may be involved.

## **4.2 Identified strategies for public involvement in reducing low-value care and their implications**

Among the strategies for public involvement identified in the scoping review there are strategies that have been specifically developed to improve value in healthcare and pre-existing strategies that have been applied in other areas of healthcare and health services research. Value-based insurance design (VBID), for example, is a strategy that was developed for managing low-value care from an economic perspective. This design shifts health insurance plans so that patients pay higher co-payments for ‘low-value care’ and lower co-payments for ‘high-value care’.<sup>97</sup> Another example is a community jury, which is a practice that was developed to engage citizens and solicit their perspectives on disinvestment decisions required by government-level bodies.<sup>203</sup> However, the role of the public in this level of decision-making remains uncertain due to the mixed support from stakeholders and lack of evaluation.

In contrast, engaging patient or public representatives in research activities is not a novel strategy; public involvement has been encouraged and used in many areas of health services research including, but not limited to, the subject of low-value care.<sup>224</sup> Patients with lived experience and members of the public are able to offer meaningful insight and input at multiple stages within the research process and can increase the effectiveness of research activities.<sup>80,81</sup> Engaging patients in shared decision-making and providing them with educational materials are also examples of pre-existing strategies that have been adapted to address low-value care. Incorporating patients’ values and preferences into decision-making about their care was introduced as a key component of evidence-based

medicine.<sup>225</sup> To date, this concept is facilitated by shared decision-making tools and patient decision aids, which are widely used in healthcare and have demonstrated effectiveness.<sup>71,75</sup> The scoping review in Chapter 2 determined that these strategies are commonly utilized for addressing low-value care and the meta-analysis in Chapter 3 showed that they are associated with a decrease in use of low-value practices. This evidence provides support for researchers and care providers to utilize shared decision-making and patient-oriented education materials to reduce low-value care within the patient-clinician interaction. Recent work, however, suggests that care providers and patients infrequently engage in shared decision-making.<sup>226,227</sup> Therefore, if shared decision-making is embraced as a strategy for reducing low-value care, researchers, care providers, and decision-makers must work in tandem to implement and encourage its use in clinical practice.

#### **4.3 Next steps to further our understanding of the role of the public in reducing low-value care**

Through a comprehensive review and synthesis of the literature pertaining to public involvement in low-value care, this research has identified three key areas where further evidence is required.

First, more high-quality evaluation is needed to build the evidence base for strategies to engage the public in reducing low-value care. At the level of the patient-clinician interaction, the number of patients who receive a low-value practice is a key outcome for evaluating the impact of strategies that engage patients, yet this outcome was only

reported in 18 of the 151 studies identified in the scoping review. Only five of these studies were randomized clinical trials with low risk of bias. This is a small number of high-quality studies considering the many different low-value practices used in various clinical settings.

The Choosing Wisely Campaign's framework for patient and public engagement may be a useful resource for guiding the evaluation of strategies for public involvement in reducing low-value care, including those that may not be amenable to evaluation through a randomized clinical trial.<sup>42</sup> For example, they suggest measuring patient-reported outcomes when evaluating patient engagement in shared decision-making about low-value care, including the quality of decision making, how they were informed, and how they were involved in the decision-making process. These outcomes supplement the measure of the use of the targeted low-value practice and provide valuable insight into how engaging patients in reducing low-value care impacts the patient experience. The framework also proposes assessments for engagement with patient organizations and patient/public representatives in the development of initiatives, including the use of tools to analyze the effectiveness of their partnerships and explore the attitudes and opinions of involved stakeholders.<sup>42</sup>

Second, future evaluation of strategies for public involvement in reducing low-value care should investigate the applicability and utility of such strategies in contexts that vary with respect to the clinical setting, the stakeholder engaged, and the nature of the healthcare system. Certain patient-targeted strategies, such as shared decision-making, may be more



easily adopted in the primary care setting where the patient and physician have a pre-existing relationship. This contextual factor may contribute to the effectiveness of patient-targeted strategies to reduce unnecessary antibiotic use in primary care settings – a scenario that was evaluated in the majority of studies included in the systematic review (Chapter 3). In contrast, acute care settings such as the emergency department or intensive care unit will require patients and caregivers to interact with less familiar clinicians to make urgent and high-risk treatment decisions. These contextual factors may add complexity to the implementation of patient-targeted interventions to reduce low-value care. Specialist care that provides elective procedures such as hip or knee replacements may also have different implications for engaging patients and caregivers due to the greater emphasis on patient choice. These examples of the influence of the clinical setting highlight the need for patient-targeted interventions to be tailored to and evaluated in different clinical settings. Given that the predominant clinical setting within the systematic review (Chapter 3) was primary care, further research in acute care and elective procedures is needed.

In addition to the clinical setting, strategies that are employed at the level of the patient-clinician interaction, such as shared decision-making or patient education, may need to be adapted to suit the target stakeholder. For example, a shared decision-making tool used to engage an adult patient in an emergency department may not have the same effect when targeting a parent of a pediatric patient. One study included in the systematic review (Chapter 3) reported such a finding, as their patient/caregiver-oriented educational tool was successful in reducing unnecessary antibiotic use in adults but not in children.<sup>184</sup>

Other clinical settings that may require caregiver engagement include long-term care and the intensive care unit where decisions may be made by surrogate decision-makers.

Third, additional research is required to explore and learn from the perspectives of stakeholders, both demand and supply-side, that are involved in the aforementioned strategies to reduce low-value care. The scoping review in Chapter 2 identified a small number of studies that examined stakeholder perspectives, but these had limited variation with respect to contextual factors such as clinical setting and country. This is a significant gap in evidence due to the multi-faceted nature of many of the identified strategies for patient engagement. For example, supply-side stakeholders often play a key role in engaging patients and the public, such as through shared decision-making. Similarly, engaging patients in disinvestment decision-making requires interaction and collaboration between public representatives and decision-makers. Further exploration of supply-side stakeholders' perspectives should inquire about their support for using these strategies as well as the tools and training they may need to embrace them, such as training in shared decision-making for clinicians or training in patient engagement for low-value care researchers.

#### **4.4 Conclusions**

A substantial body of literature suggests that the public plays an important role in reducing low-value care. Shared decision-making and patient education are promising strategies for engaging patients, families, and caregivers in the patient-clinician interaction within primary care, but require further examination to explore their utility

under different clinical circumstances. There is considerably less evidence to support the role of the public in low-value care research and administrative/policy-level decision making, which should be supplemented with research that explores stakeholder perspectives about public involvement and evaluates its impact.

## References

1. Elshaug AG, Rosenthal MB, Lavis JN, et al. Levers for addressing medical underuse and overuse: achieving high-value health care. *Lancet*. 2017;390(10090):191-202. doi:10.1016/S0140-6736(16)32586-7
2. Choosing Wisely Canada. Imaging Tests for Lower Back Pain: When you need them and when you don't - Choosing Wisely Canada. <https://choosingwiselycanada.org/imaging-tests-low-back-pain/>. Accessed April 5, 2019.
3. Choosing Wisely Canada. Five Things Physicians and Patients should question. [http://www.healthquality.va.gov/mtbi/concussion\\_mtbi\\_full\\_1\\_0.pdf](http://www.healthquality.va.gov/mtbi/concussion_mtbi_full_1_0.pdf). Published 2012. Accessed April 5, 2019.
4. Davis PC, Wippold FJ, Brunberg JA, et al. ACR Appropriateness Criteria® on Low Back Pain. *J Am Coll Radiol*. 2009;6(6):401-407. doi:10.1016/j.jacr.2009.02.008
5. Fazel R, Krumholz HM, Wang Y, et al. Exposure to Low-Dose Ionizing Radiation from Medical Imaging Procedures. *N Engl J Med*. 2009;361(9):849-857. doi:10.1056/NEJMoa0901249
6. Fraser J, Reed M. Appropriateness of Imaging in Canada. 2013. doi:10.1016/j.carj.2013.02.006
7. Canadian Institute for Health Information. *Unnecessary Care in Canada*. Ottawa, ON; 2017.
8. Barua B, Jacques D. *Comparing Performance of Universal Health Care Countries*.; 2018.
9. Canadian Institute for Health Information. *Medical Imaging in Canada 2007*. Ottawa, ON; 2008.
10. Elshaug AG, McWilliams JM, Landon BE. The value of low-value lists. *JAMA - J Am Med Assoc*. 2013;309(8):775-776. doi:10.1001/jama.2013.828
11. Berwick DM. Avoiding overuse—the next quality frontier. *Lancet*. 2017;390:102-104. doi:10.1016/S0140-6736(16)32570-3
12. Owens DK, Qaseem A, Chou R, Shekelle P. High-Value, Cost-Conscious Health Care: Concepts for Clinicians to Evaluate the Benefits, Harms, and Costs of Medical Interventions. *Ann Intern Med*. 2011;154(3):174. doi:10.7326/0003-4819-154-3-201102010-00007
13. Garner S, Littlejohns P. Disinvestment from low value clinical interventions: NICELY done? *BMJ*. 2011;343(7819):d4519-d4519. doi:10.1136/bmj.d4519
14. Bece A, Hamilton C, Hickey BE. Over 150 potentially low-value health care practices: an Australian study. *Med J Aust*. 2013;198(11):597-598. doi:10.5694/mja13.10080
15. Mark Fendrick A, Smith DG, Chernew ME. Applying value-based insurance design to low-value health services. *Health Aff*. 2010;29(11):2017-2021. doi:10.1377/hlthaff.2010.0878
16. Ginsburg M. Value-based insurance design: Consumers' views on paying more for high-cost, low-value care. *Health Aff*. 2010;29(11):2022-2026. doi:10.1377/hlthaff.2010.0808
17. Cassel CK, Guest JA. Choosing Wisely. *JAMA*. 2012;307(17):1801.

- doi:10.1001/jama.2012.476
18. Levinson W, Huynh T. Engaging physicians and patients in conversations about unnecessary tests and procedures: Choosing Wisely Canada. *Cmaj*. 2014;186(5):325-326. doi:10.1503/cmaj.131674
  19. Levinson W, Kallewaard M, Bhatia RS, et al. "Choosing Wisely": a growing international campaign. *BMJ Qual Saf*. 2015;24(2):167-174. doi:10.1136/bmjqs-2014-003821
  20. Levinson W, Born K, Wolfson D. Choosing Wisely Campaigns. *JAMA*. April 2018. doi:10.1001/jama.2018.2202
  21. Rosenberg A, Agiro A, Gottlieb M, et al. Early Trends Among Seven Recommendations From the Choosing Wisely Campaign. *JAMA Intern Med*. 2015;175(12):1913. doi:10.1001/jamainternmed.2015.5441
  22. Ferrari R, Prosser C. Testing Vitamin D Levels and Choosing Wisely. *JAMA Intern Med*. 2016;176(7):1019. doi:10.1001/jamainternmed.2016.1929
  23. Neeman N, Quinn K, Soni K, Mourad M, Sehgal NL. Reducing Radiology Use on an Inpatient Medical Service: Choosing Wisely. *Arch Intern Med*. 2012;172(20):1606. doi:10.1001/archinternmed.2012.4293
  24. Scott IA, Elshaug AG. Foregoing low-value care: How much evidence is needed to change beliefs? *Intern Med J*. 2013;43(2):107-109. doi:10.1111/imj.12065
  25. Elshaug AG, Hiller JE, Tunis SR, Moss JR. Challenges in Australian policy processes for disinvestment from existing, ineffective health care practices. *Aust New Zealand Health Policy*. 2007;4(1):23. doi:10.1186/1743-8462-4-23
  26. Zikmund-Fisher BJ, Kullgren JT, Fagerlin A, Klamerus ML, Bernstein SJ, Kerr EA. Perceived Barriers to Implementing Individual Choosing Wisely® Recommendations in Two National Surveys of Primary Care Providers. *J Gen Intern Med*. 2017;32(2):210-217. doi:10.1007/s11606-016-3853-5
  27. Fenton JJ, Franks P, Feldman MD, et al. Impact of Patient Requests on Provider-Perceived Visit Difficulty in Primary Care. *J Gen Intern Med*. 2014;30(2):214-220. doi:10.1007/s11606-014-3082-8
  28. O'Malley AS, Collins A, Contreary K, Rich EC. Barriers to and Facilitators of Evidence-Based Decision Making at the Point of Care. *MDM Policy Pract*. 2016;1(1):238146831666037. doi:10.1177/2381468316660375
  29. Kline KP, Shaw L, Beyth RJ, et al. Perceptions of patients and providers on myocardial perfusion imaging for asymptomatic patients, choosing wisely, and professional liability. *BMC Health Serv Res*. 2017;17(1):553. doi:10.1186/s12913-017-2510-y
  30. Blumenthal-Barby JS. "Choosing wisely" to reduce low-value care: A conceptual and ethical analysis. *J Med Philos (United Kingdom)*. 2013;38(5):559-580. doi:10.1093/jmp/jht042
  31. Badgery-Parker T, Pearson S-A, Dunn S, Elshaug AG. Measuring Hospital-Acquired Complications Associated With Low-Value Care. *JAMA Intern Med*. 2019;179(4):499. doi:10.1001/jamainternmed.2018.7464
  32. Korenstein D, Chimonas S, Barrow B, Keyhani S, Troy A, Lipitz-Snyderman A. Development of a Conceptual Map of Negative Consequences for Patients of Overuse of Medical Tests and Treatments. *JAMA Intern Med*. 2018;178(10):1401-1407. doi:10.1001/jamainternmed.2018.3573

33. Dhruva SS, Schroeder AR, Morgan DJ, Young PC, Coon ER, Quinonez RA. 2017 Update on Pediatric Medical Overuse. *JAMA Pediatr.* 2018;172(5):482. doi:10.1001/jamapediatrics.2017.5752
34. Schlesinger M, Grob R. Treating, Fast and Slow: Americans' Understanding of and Responses to Low-Value Care. *Milbank Q.* 2017;95(1):70-116. doi:10.1111/1468-0009.12246
35. Sutkowi-Hemstreet A, Vu M, Harris R, Brewer NT, Dolor RJ, Sheridan SL. Adult Patients' Perspectives on the Benefits and Harms of Overused Screening Tests: a Qualitative Study. *J Gen Intern Med.* 2015;30(11):1618-1626. doi:10.1007/s11606-015-3283-9
36. Silverstein W, Lass E, Born K, Morinville A, Levinson W, Tannenbaum C. A survey of primary care patients' readiness to engage in the de-adoption practices recommended by Choosing Wisely Canada. *BMC Res Notes.* 2016;9(9):1-8. doi:10.1186/s13104-016-2103-6
37. Elshaug AG, Rosenthal MB, Lavis JN, et al. Levers for addressing medical underuse and overuse: achieving high-value health care. *Lancet.* 2017;390(10090):191-202. doi:10.1016/S0140-6736(16)32586-7
38. Buist D. Primary Care Clinicians' Perspectives on Reducing Low-Value Care in an Integrated Delivery System. *Perm J.* 2015;20(1):41-46. doi:10.7812/TPP/15-086
39. Bishop TF, Cea M, Miranda Y, et al. Academic physicians' views on low-value services and the choosing wisely campaign: A qualitative study. *Healthcare.* 2017;5(1-2):17-22. doi:10.1016/j.hjdsi.2016.04.001
40. Home - Right Care Alliance. <https://rightcarealliance.org/>. Accessed April 25, 2018.
41. Cho HJ, Wray CM, Maione S, et al. Right Care in Hospital Medicine: Co-creation of Ten Opportunities in Overuse and Underuse for Improving Value in Hospital Medicine. *Journal of General Internal Medicine.* 2018:1-3.
42. Born KB, Coulter A, Han A, et al. Engaging patients and the public in Choosing Wisely. *BMJ Qual Saf.* 2017;26(8):687-691. doi:10.1136/bmjqs-2017-006595
43. Canada CW. Introducing the Choosing Wisely Canada Patient and Public Advisors - Choosing Wisely Canada. 2018. doi:10.1001/jama.294.17.2203
44. Weiner J, Rosenquist R. Issue at the Heart of Advancing the De-Adoption of Low-Value Care. Proceedings from an expert roundtable. *LDI Issue Brief.* 2017;21(6):1-4.
45. Niven DJ, Mrklas KJ, Holodinsky JK, et al. Towards understanding the de-adoption of low-value clinical practices: a scoping review. *BMC Med.* 2015;13(1):255. doi:10.1186/s12916-015-0488-z
46. Carroll AE. The High Costs of Unnecessary Care. *JAMA.* 2017;318(18):1748. doi:10.1001/jama.2017.16193
47. Prasad V, Vandross A, Toomey C, et al. A Decade of Reversal: An Analysis of 146 Contradicted Medical Practices. *Mayo Clin Proc.* 2013;88(8):790-798. doi:10.1016/j.mayocp.2013.05.012
48. Cassel CK, Guest JA. Choosing Wisely. *Jama.* 2012;307(17):1801. doi:10.1001/jama.2012.476
49. Niven DJ, Rubenfeld GD, Kramer AA, Stelfox HT. Effect of Published Scientific Evidence on Glycemic Control in Adult Intensive Care Units. *JAMA Intern Med.*

- 2015;175(5):801. doi:10.1001/jamainternmed.2015.0157
50. Montini T, Graham ID. “Entrenched practices and other biases”: Unpacking the historical, economic, professional, and social resistance to de-implementation. *Implement Sci.* 2015;10(1):24. doi:10.1186/s13012-015-0211-7
  51. Colla CH, Mainor AJ, Hargreaves C, Sequist T, Morden N. *Interventions Aimed at Reducing Use of Low-Value Health Services: A Systematic Review.* Vol 74.; 2017. doi:10.1177/1077558716656970
  52. Mackean G, Noseworthy T, Elshaug AG, et al. Health Technology Reassessment: The Art of the Possible Clinical Advisory and Research Branch. *Int J Technol Assess Health Care.* 2018;29(4):418-423. doi:10.1017/S0266462313000494
  53. Harris C, Ko H, Waller C, Sloss P, Williams P. Sustainability in health care by allocating resources effectively (SHARE) 4: exploring opportunities and methods for consumer engagement in resource allocation in a local healthcare setting. *BMC Health Serv Res.* 2017;17(1):329. doi:10.1186/s12913-017-2212-5
  54. Oren O, Kebebew E, Ioannidis JPA. Curbing Unnecessary and Wasted Diagnostic Imaging. *JAMA.* 2019;321(3):245. doi:10.1001/jama.2018.20295
  55. Brownlee S, Berman A. *Defining Value in Health Care Resource Utilization: Articulating the Role of the Patient.*; 2016.
  56. Colla CH. Swimming against the Current — What Might Work to Reduce Low-Value Care? *N Engl J Med.* 2014;371(14):1280-1283. doi:10.1056/NEJMp1404503
  57. The Joanna Briggs Institute. The Joanna Briggs Institute Reviewers’ Manual 2015: Methodology for JBI scoping reviews. *Joanne Briggs Inst.* 2015:1-24. doi:10.1017/CBO9781107415324.004
  58. Garritty C, Moher D, Aldcroft A, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169(7):467. doi:10.7326/m18-0850
  59. McGowan J, Sampson M, Salzwedel DM, Cogo E, Foerster V, Lefebvre C. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. *J Clin Epidemiol.* 2016;75:40-46. doi:10.1016/j.jclinepi.2016.01.021
  60. Canadian Agency for Drugs and Technologies in Health. Grey Matters: a practical tool for searching health-related grey literature. <https://www.cadth.ca/resources/finding-evidence/grey-matters>. Published 2015. Accessed April 11, 2018.
  61. Landis JR, Koch GG. The Measurement of Observer Agreement for Categorical Data. *Biometrics.* 1977;33(1):159. doi:10.2307/2529310
  62. Hislop JM. Societal Preferences for Health Technology Disinvestment Policy: Views of Scottish Taxpayers – A Qualitative Study. *Value Heal.* 2011;14(7):A356-A357. doi:10.1016/j.jval.2011.08.680
  63. Daniels T, Williams I, Bryan S, Mitton C, Robinson S. Involving citizens in disinvestment decisions: What do health professionals think? Findings from a multi-method study in the English NHS. *Heal Econ Policy Law.* 2018;13(2):162-188. doi:10.1017/S1744133117000330
  64. Kanzaria HK, Brook RH, Probst MA, Harris D, Berry SH, Hoffman JR. Emergency physician perceptions of shared decision-making. *Acad Emerg Med.* 2015;22(4):399-405. doi:10.1111/acem.12627

65. Scales K, Zimmerman S, Reed D, et al. Nurse and Medical Provider Perspectives on Antibiotic Stewardship in Nursing Homes. *J Am Geriatr Soc.* 2017;65(1):165-171. doi:10.1111/jgs.14504
66. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implement Sci.* 2012;7(1):50. doi:10.1186/1748-5908-7-50
67. Nuffield Council on Bioethics. *Public Health: Ethical Issues.* London; 2017.
68. Bansback N, Chiu J, Kerr S, McCracken, Forster B. Reducing Imaging Tests for Low Back Pain: Can Patients Choose Wisely? *Arthritis Rheumatol.* 2016;68(Suppl 10).
69. Elwyn G, Laitner S, Coulter A, Walker E, Watson P, Thomson R. Implementing shared decision making in the NHS. *BMJ.* 2010;341(4):c5146. doi:10.1136/bmj.c5146
70. O'Connor AM, Wennberg JE, Legare F, et al. Toward The 'Tipping Point': Decision Aids And Informed Patient Choice. *Health Aff.* 2007;26(3):716-725. doi:10.1377/hlthaff.26.3.716
71. Elwyn G, Frosch D, Thomson R, et al. Shared Decision Making: A Model for Clinical Practice. *J Gen Intern Med.* 2012;27(10):1361-1367. doi:10.1007/s11606-012-2077-6
72. Hess EP, Hollander JE, Schaffer JT, et al. Shared decision making in patients with low risk chest pain: Prospective randomized pragmatic trial. *BMJ.* 2016;355. doi:10.1136/bmj.i6165
73. Linsky A., Simon S.R., Bokhour B. Patient perceptions of proactive medication discontinuation. *Patient Educ Couns.* 2015;98(2):220-225. doi:10.1016/j.pec.2014.11.010
74. Schoenborn NL, Lee K, Pollack CE, et al. Older adults' views and communication preferences about cancer screening cessation. *JAMA Intern Med.* 2017;177(8):1121-1128. doi:10.1001/jamainternmed.2017.1778
75. Stacey D, Légaré F, Lewis K, et al. Decision aids for people facing health treatment or screening decisions. Stacey D, ed. *Cochrane Database Syst Rev.* 2017;2017(4):CD001431. doi:10.1002/14651858.CD001431.pub5
76. Hodgetts K, Hiller JE, Street JM, et al. Disinvestment policy and the public funding of assisted reproductive technologies: outcomes of deliberative engagements with three key stakeholder groups. *BMC Health Serv Res.* 2014;14(1):204. doi:10.1186/1472-6963-14-204
77. Street JM, Callaghan P, Braunack-Mayer AJ, Hiller JE. Citizens' Perspectives on Disinvestment from Publicly Funded Pathology Tests: A Deliberative Forum. *Value Heal.* 2015;18(8):1050-1056. doi:10.1016/j.jval.2015.05.012
78. Litva A, Coast J, Donovan J, et al. "The public is too subjective": public involvement at different levels of health-care decision making. *Soc Sci Med.* 2002;54(12):1825-1837.
79. Mitton C, Smith N, Peacock S, Evoy B, Abelson J. Public participation in health care priority setting: A scoping review. *Health Policy (New York).* 2009;91:219-228. doi:10.1016/j.healthpol.2009.01.005
80. Manafo E, Petermann L, Mason-Lai P, Vandall-Walker V. Patient engagement in Canada: a scoping review of the 'how' and 'what' of patient engagement in health research. *Heal Res Policy Syst.* 2018;16(1):5. doi:10.1186/s12961-018-0282-4



81. Brett J, Staniszewska S, Mockford C, et al. Mapping the impact of patient and public involvement on health and social care research: a systematic review. *Heal Expect*. 2014;17(5):637-650. doi:10.1111/j.1369-7625.2012.00795.x
82. Kullgren JT, Malani P, Kirch M, et al. A National Survey of Older Americans About Overuse of Health Care Services. *J Gen Intern Med*. 2018;33(S2):83-840. doi:10.1007/s11606-018-4413-y
83. Rohrbacher R, Marx P, Schaufler T, Schneider H. Patient-based medicine: Aligning patients' perspectives on disease and treatment with evidence-based medicine criteria. *J Public Health (Bangkok)*. 2009;17(3):167-176. doi:10.1007/s10389-008-0213-x
84. Hislop JM. Societal preferences for health technology disinvestment policy: Views of scottish taxpayers - A qualitative study. *Value Heal ISPOR 14th Annu Eur Congr Madrid Spain Conference Start 20111105 Conf End 20111108 Conference Publ*. 2011;14(7):November. doi:10.1016/j.jval.2011.08.680
85. Aggarwal A, Sullivan R. Affordability of cancer care in the United Kingdom - Is it time to introduce user charges? *J Cancer Policy*. 2014;2(2):31-39. doi:10.1016/j.jcpo.2013.11.001
86. Alber K, Kuehlein T, Schedlbauer A, Schaffer S. Medical overuse and quaternary prevention in primary care - A qualitative study with general practitioners. *BMC Fam Pract*. 2017;18(1):99. doi:10.1186/s12875-017-0667-4
87. Allam A, Kostova Z, Nakamoto K, Schulz PJ. The effect of social support features and gamification on a web-based intervention for rheumatoid arthritis patients: Randomized controlled trial. *J Med Internet Res*. 2015;17(1):e14. doi:10.2196/jmir.3510
88. Almoosa KF, Siska R, Luther K, Patel B. Reducing Futile Care in the ICU Using Early Multidisciplinary Family Meetings. *Chest*. 2010;138(4):789A. doi:10.1378/CHEST.10151
89. Anstey MHR, Weinberger SE, Roberts DH. Teaching and practicing cost-awareness in the intensive care unit: A TARGET to aim for. *J Crit Care*. 2014;29(1):107-111. doi:10.1016/j.jcrc.2013.08.007
90. Ashe D, Patrick PA, Stempel MM, Shi Q, Brand DA. Educational Posters to Reduce Antibiotic Use. *J Pediatr Heal Care*. 2006;20(3):192-197. doi:10.1016/j.pedhc.2005.12.017
91. Bezin J, Francis F, Nguyen NV, Moore N. Impact of a Public Intervention in the Media on the Use of Statins in Patients at Various Cardiovascular risks. *Pharmacoepidemiol Drug Saf*. 2015;24(S1):1-587. doi:10.1002/pds.3838
92. Bodenheimer T, Fernandez A. High and rising health care costs. Part 4: Can costs be controlled while preserving quality? *Ann Intern Med*. 2005;143(1):26-31. doi:10.7326/0003-4819-143-1-200507050-00007
93. Bolt EE, Pasman HRW, Willems D, Onwuteaka-Philipsen BD. Appropriate and inappropriate care in the last phase of life: an explorative study among patients and relatives. *BMC Health Serv Res*. 2016;16(1):1-11. doi:10.1186/s12913-016-1879-3
94. Borasio GD, Jox RJ. Choosing wisely at the end of life: the crucial role of medical indication. *Swiss Med Wkly*. 2016;146(November):w14369. doi:10.4414/smw.2016.14369
95. Burgess MM. Ethical and economic aspects of noncompliance and overtreatment.

- CMAJ*. 1989;141(8):777-780.
96. Burns M, Dyer MB, Bailit M. Reducing Overuse and Misuse: State strategies to improve quality and cost of health care. 2014;(January):1-9.
  97. Chernew ME, Fendrick AM, Kachniarz B. Value-Based Insurance Design. *Health Aff*. 2007;26(2):w195-w203. doi:10.1016/B978-0-12-375678-7.00910-X
  98. Colla CH. Swimming against the Current — What Might Work to Reduce Low-Value Care? *N Engl J Med*. 2014;371(14):1280-1283. doi:10.1056/NEJMp1404503
  99. Cooper Z, Sayal P, Abbett SK, Neuman MD, Rickerson EM, Bader AM. A Conceptual Framework for Appropriateness in Surgical Care. *Anesthesiology*. 2015;123(6):1450-1454. doi:10.1097/ALN.0000000000000899
  100. Dollman WB, LeBlanc VT, Stevens L, O'Connor PJ, Turnidge JD. A community-based intervention to reduce antibiotic use for upper respiratory tract infections in regional South Australia. *Med J Aust*. 2005;182(12):617-620. doi:dol10813\_fm [pii]
  101. Engineer RS, Podolsky SR, Fertel BS, et al. A Pilot Study to Reduce Computed Tomography Utilization for Pediatric Mild Head Injury in the Emergency Department Using a Clinical Decision Support Tool and a Structured Parent Discussion Tool. *Pediatr Emerg Care*. 2018;00(00):1. doi:10.1097/PEC.0000000000001501
  102. Filipetto FA, Modi DS, Weiss LB, Ciervo CA. Patient knowledge and perception of upper respiratory infections, antibiotic indications and resistance. *Patient Prefer Adherence*. 2008;2:35-39.
  103. Francis NA, Butler CC, Hood K, Simpson S, Wood F, Nuttall J. Effect of using an interactive booklet about childhood respiratory tract infections in primary care consultations on reconsulting and antibiotic prescribing: A cluster randomised controlled trial. *BMJ*. 2009;339(7717):374-376. doi:10.1136/bmj.b2885
  104. Fraser W, Maunsell E, Hodnett E, Moutquin J-M, St-Francois P. Randomized controlled trial of a prenatal vaginal birth after cesarean section education and support program and the Childbirth Alternatives Post-Cesarean Study Group. *Am J Obstet Gynecol*. 1997;176(2):419-425. doi:S0002-9378(97)70509-X [pii]
  105. Frush K. Why and when to use CT in children: perspective of a pediatric emergency medicine physician. *Pediatr Radiol*. 2014;44(3):409-413. doi:10.1007/s00247-014-3122-x
  106. Ghanouni A, Meisel SF, Renzi C, Wardle J, Waller J. Survey of public definitions of the term “overdiagnosis” in the UK. *BMJ Open*. 2016;6(4):1-6. doi:10.1136/bmjopen-2015-010723
  107. Gonzales R, Corbett KK, Wong S, et al. “Get Smart Colorado.” 2008;46(6):597-605.
  108. Green AR, Tung M, Segal JB. Older Adults’ Perceptions of the Causes and Consequences of Healthcare Overuse: A Qualitative Study. *J Gen Intern Med*. 2018;33(6):892-897. doi:10.1007/s11606-017-4264-y
  109. 265 - Hemo 2009 .pdf.
  110. Hersch J, Barratt A, Jansen J, et al. Use of a decision aid including information on overdetection to support informed choice about breast cancer screening: A randomised controlled trial. *Lancet*. 2015;385(9978):1642-1652.

- doi:10.1016/S0140-6736(15)60123-4
111. Herwig A, Weltermann B. Study protocol for a matter of heart: A qualitative study of patient factors driving overuse of cardiac catheterisation. *BMJ Open*. 2017;7(9):1-7. doi:10.1136/bmjopen-2017-017629
  112. Hess EP, Knoedler MA, Shah ND, et al. The chest pain choice decision aid: A randomized trial. *Circ Cardiovasc Qual Outcomes*. 2012;5(3):251-259. doi:10.1161/CIRCOUTCOMES.111.964791
  113. Kanzaria HK, Hoffman JR, Probst MA, Caloyeras JP, Berry SH, Brook RH. Emergency physician perceptions of medically unnecessary advanced diagnostic imaging. *Acad Emerg Med*. 2015;22(4):390-398. doi:10.1111/acem.12625
  114. Keating NL, Pace LE. Breast Cancer Screening in 2018. *Jama*. 2018;319(17):1814. doi:10.1001/jama.2018.3388
  115. Khunpradit S, Tavender E, Lumbiganon P, Laopai boon M, Wasiak J, Gruen RL. Non-clinical interventions for reducing unnecessary caesarean section. *Cochrane Database Syst Rev*. 2011;(6). doi:10.1002/14651858.CD005528.pub2
  116. Kinkade S, Long NA. Acute Bronchitis. *Am Fam Physician*. 2016;94(7):560-565.
  117. Kline KP, Shaw L, Beyth RJ, et al. Perceptions of patients and providers on myocardial perfusion imaging for asymptomatic patients, choosing wisely, and professional liability. *BMC Health Serv Res*. 2017;17(1):553. doi:10.1186/s12913-017-2510-y
  118. Kotwal A, MD MS, Schonberg M, MD MPH. Cancer Screening in the Elderly: A Review of Breast, Colorectal, Lung, and Prostate Cancer Screening. *Cancer J*. 2017;23(4):246-253. doi:10.1097/PPO.0000000000000274
  119. Kozhimannil KB, Law MR, Virnig BA. Cesarean Delivery Rates Vary Tenfold Among US Hospitals; Reducing Variation May Address Quality And Cost Issues. *Health Aff*. 2013;32(3):527-535. doi:10.1377/hlthaff.2012.1030
  120. Kuehn BM. Materials educate patients to make wise choices on tests and procedures. *JAMA J Am Med Assoc*. 2012;307(21):2245. doi:http://dx.doi.org/10.1001/jama.2012.5341
  121. Larson PA. Appropriateness Criteria and Patient Expectations. *J Am Coll Radiol*. 2010;7(3):168-170. doi:10.1016/j.jacr.2009.07.008
  122. Laws A. Patient requests for nonbeneficial care [2]. *JAMA - J Am Med Assoc*. 2012;307(17):1797-1798. doi:10.1001/jama.307.17.1797-b
  123. Légaré F, Labrecque M, Cauchon M, Castel J, Turcotte S, Grimshaw J. Training family physicians in shared decision-making to reduce the overuse of antibiotics in acute respiratory infections: A cluster randomized trial. *Cmaj*. 2012;184(13):726-734. doi:10.1503/cmaj.120568
  124. Legemate DA, Koelemay MJW, Ubbink DT. Number unnecessarily treated in relation to harm. A concept physicians and patients need to understand. *Ann Surg*. 2016;263(5):855-856. doi:10.1097/SLA.0000000000001522
  125. Leung SYJ, Wong AW, Wong AT. Public engagement in promoting antibiotic awareness in Hong Kon. *Antimicrob Resist Infect Control*. 2017;6(Suppl 3):P71. doi:10.1186/s13756-017-0201-4
  126. Levinson W, Kallewaard M, Bhatia RS, Wolfson D, Shortt S, Kerr EA. “Choosing Wisely”: A growing international campaign. *BMJ Qual Saf*. 2015;24(2):167-174. doi:10.1136/bmjqs-2014-003821

127. Macfarlane J, Holmes W, Gard P, Thornhill D, Macfarlane R. Primary care patient information leaflet. *Bmj*. 2002;324(January):91-94.
128. Maire J. Promoting conversations through choosing wisely. Helping physicians and patients engage in crucial conversations. *Iowa Med*. 104(2):19.
129. Martin CL, Njike VY, Katz DL. Back-up antibiotic prescriptions could reduce unnecessary antibiotic use in rhinosinusitis. *J Clin Epidemiol*. 2004;57(4):429-434. doi:10.1016/j.jclinepi.2003.09.008
130. Mason DJ. Choosing Wisely: Changing Clinicians, Patients, or Policies? 2015;313(7).
131. McCaffery KJ, Jansen J, Scherer LD, et al. Walking the tightrope: Communicating overdiagnosis in modern healthcare. *BMJ*. 2016;352(February):1-5. doi:10.1136/bmj.i348
132. Mccanne D. Paying for low-value care 2018 Report to the Congress. 2018.
133. Montgomery AA, Emmett CL, Fahey T, et al. Two decision aids for mode of delivery among women with previous caesarean section: randomised controlled trial. *BMJ*. 2007;334(7607):1305. doi:10.1136/bmj.39217.671019.55
134. Moore JE. Women's voices in maternity care: The triad of shared decision making, informed consent, and evidence-based practices. *J Perinat Neonatal Nurs*. 2016;30(3):218-223. doi:10.1097/JPN.000000000000182
135. Morgan DJ, Dhruva SS, Coon ER, Wright SM, Korenstein D. 2018 Update on Medical Overuse. *JAMA Intern Med*. 2019;179(2):240. doi:10.1001/jamainternmed.2018.5748
136. Morgan DJ, Leppin AL, Smith CD, Korenstein D. A Practical Framework for Understanding and Reducing Medical Overuse: Conceptualizing Overuse Through the Patient-Clinician Interaction. *J Hosp Med*. 2017;12(5):346-351. doi:10.12788/jhm.2738
137. Morgan JD, Wright DJ, Chrystyn H. Pharmacoeconomic evaluation of a patient education letter aimed at reducing long-term prescribing of benzodiazepines. *Pharm World Sci*. 2002;24(6):231-235. doi:10.1023/A:1021587209529
138. Moynihan R, Nickel B, Hersch J, et al. Public opinions about overdiagnosis: A national community survey. *PLoS One*. 2015;10(5):1-13. doi:10.1371/journal.pone.0125165
139. Murphy MF. The Choosing Wisely campaign to reduce harmful medical overuse: Its close association with Patient Blood Management initiatives. *Transfus Med*. 2015;25(5):287-292. doi:10.1111/tme.12256
140. Nagler RH, Franklin Fowler E, Gollust SE. Women's Awareness of and Responses to Messages about Breast Cancer Overdiagnosis and Overtreatment. *Med Care*. 2017;55(10):879-885. doi:10.1097/MLR.0000000000000798
141. Newton EH. Addressing overuse in emergency medicine: evidence of a role for greater patient engagement. *Clin Exp Emerg Med*. 2017;4(4):189-200. doi:10.15441/ceem.17.233
142. Nilsen ML, Johnson JT. Potential for low-value palliative care of patients with recurrent head and neck cancer. *Lancet Oncol*. 2017;18(5):e284--e289. doi:10.1016/S1470-2045(17)30260-7
143. Parmar MS. A Systematic Evaluation of Factors Contributing to Overdiagnosis and Overtreatment. *South Med J*. 2016;109(4):272-276.

doi:10.14423/SMJ.00000000000000409

144. Pereko DD, Lubbe MS, Essack SY. Public knowledge, attitudes and behaviour towards antibiotic usage in Windhoek, Namibia. *South African J Infect Dis.* 2015;30(4):134-137. doi:10.1080/23120053.2015.1107290
145. Perz JF, Craig AS, Coffey CS, et al. Changes in antibiotic prescribing for children after a community-wide campaign. *JAMA.* 2002;287(23):3103-3109.
146. Prescrire. Determining the harm-benefit balance of an intervention: for each patient. *Prescrire Int.* 2014;34(367):381-385.
147. Price S, Haxby E. Managing futility in critically ill patients with cardiac disease. *Nat Rev Cardiol.* 2013;10(12):723-731. doi:10.1038/nrcardio.2013.161
148. Razmaria AA. High-Value Care. *JAMA.* 2015;314(22):2462. doi:10.1001/jama.2015.16990
149. Reid RO, Rabideau B, Sood N. Impact of consumer-directed health plans on low-value healthcare. *Am J Manag Care.* 2017;23(12):741-748.
150. Santa JS. Communicating information about “what not to do” to consumers. *BMC Med Inform Decis Mak.* 2013;13(SUPPL.3). doi:10.1186/1472-6947-13-S3-S2
151. Sawaya GF, Smith-McCune KK, Gregorich SE, Moghadassi M, Kuppermann M. Effect of professional society recommendations on women’s desire for a routine pelvic examination. *Am J Obstet Gynecol.* 2017;217(3):338.e1-338.e7. doi:10.1016/j.ajog.2017.05.003
152. Schleifer D, Rothman DJ. “The Ultimate Decision Is Yours”: Exploring Patients’ Attitudes about the Overuse of Medical Interventions. *PLoS One.* 2012;7(12). doi:10.1371/journal.pone.0052552
153. Schneiderman LJ, Gilmer T, Teetzel HD, et al. Effect of Ethics Consultations on Nonbeneficial Life-Sustaining Treatments in the Intensive Care Setting. *JAMA.* 2003;290(9):1166. doi:10.1001/jama.290.9.1166
154. Scott IA, Duckett SJ. In search of professional consensus in defining and reducing low-value care. *Med J Aust.* 2015;203(4):179-181. doi:10.5694/mja14.01664
155. Shallcross LJ, Howard SJ, Fowler T, Davies SC. Tackling the threat of antimicrobial resistance: From policy to sustainable action. *Philos Trans R Soc B Biol Sci.* 2015;370(1670). doi:10.1098/rstb.2014.0082
156. Sheridan SL, Sutkowi-Hemstreet A, Barclay C, et al. A comparative effectiveness trial of alternate formats for presenting benefits and harms information for low-value screening services a randomized clinical trial. *JAMA Intern Med.* 2016;176(1):31-40. doi:10.1001/jamainternmed.2015.7339
157. Simpson KR, Newman G, Chirino OR. Patient Education to Reduce Elective Labor Inductions. *MCN, Am J Matern Nurs.* 2010;35(4):188-194. doi:10.1097/NMC.0b013e3181d9c6d6
158. Singh N, Hess E, Guo G, et al. Tablet-Based Patient-Centered Decision Support for Minor Head Injury in the Emergency Department: Pilot Study. *JMIR mHealth uHealth.* 2017;5(9):e144. doi:10.2196/mhealth.8732
159. Spong CY. Prevention of the First Cesarean Delivery. *Obstet Gynecol Clin North Am.* 2015;42(2):377-380. doi:10.1016/j.ogc.2015.01.010
160. Sutkowi-Hemstreet A, Vu M, Harris R, Brewer NT, Dolor RJ, Sheridan SL. Adult Patients’ Perspectives on the Benefits and Harms of Overused Screening Tests: a Qualitative Study. *J Gen Intern Med.* 2015;30(11):1618-1626.

doi:10.1007/s11606-015-3283-9

161. Tannenbaum C, Martin P, Tamblyn R, Benedetti A, Ahmed S. Reduction of inappropriate benzodiazepine prescriptions among older adults through direct patient education: The EMPOWER cluster randomized trial. *JAMA Intern Med.* 2014;174(6):890-898. doi:10.1001/jamainternmed.2014.949
162. Taylor JA, Kwan-Gett TSC, McMahon EM. Effectiveness of an Educational Intervention in Modifying Parental Attitudes About Antibiotic Usage in Children. *Pediatrics.* 2003;111(5):e548-e554. doi:10.1542/peds.111.5.e548
163. Torke AM, Schwartz PH, Holtz LR, Montz K, Sachs GA. Caregiver Perspectives on Cancer Screening for Persons with Dementia: “Why Put Them Through It?” *J Am Geriatr Soc.* 2013;61(8):1309-1314. doi:10.1111/jgs.12359
164. Torke AM, Schwartz PH, Holtz LR, Montz K, Sachs GA. Older adults and forgoing cancer screening: “I think it would be strange.” *JAMA Intern Med.* 2013;173(7):526-531. doi:10.1001/jamainternmed.2013.2903
165. Tuso P. Choosing Wisely and Beyond: Shared Decision Making and Chronic Kidney Disease. *Perm J.* 2013;17(4):75-78. doi:10.7812/TPP/13-006
166. VBID Health. *Tackling the Epidemic of Low-Value Spending and Medical Overuse : Opportunities for Purchasers and Carriers.* Boston; 2017.
167. Veet CA, Pessu O, Bump GM. Don’t click it, reduce the stick it: A quality improvement initiative to reduce daily inpatient laboratory draws. *J Gen Intern Med.* 2017;32(Suppl 2):83-808. doi:10.1007/s11606-017-4028-8
168. Volpp KG, Loewenstein G, Asch DA. Choosing Wisely. *JAMA.* 2012;308(16):1635. doi:10.1001/jama.2012.13616
169. Walsh-Childers K, Braddock J. Assessing U.S. Health Journalists’ Beliefs About Medical Overtreatment and the Impact of Related News Coverage. *Health Commun.* 2018;33(2):202-211. doi:10.1080/10410236.2016.1254079
170. Warner AS, Shah N, Morse A, et al. Patient and Physician Attitudes Toward Low-Value Diagnostic Tests. *JAMA Intern Med.* 2016;176(8):1219. doi:10.1001/jamainternmed.2016.2936
171. Weiner J. Identifying Low-Value Care is One Thing; Eliminating it is Quite Another. *LDI Heal Econ.* 2013.
172. Anonymous. To avoid misdiagnoses and unnecessary care, take the time to engage patients, listen to their concerns. *ED Manag.* 2015;27(3):Suppl-4.
173. Wennberg JE, O’Connor AM, Collins ED, Weinstein JN. Extending The P4P Agenda, Part 1: How Medicare Can Improve Patient Decision Making And Reduce Unnecessary Care. *Health Aff.* 2007;26(6):1564-1574. doi:10.1377/hlthaff.26.6.1564
174. Wheeler JG, Fair M, Simpson PM, Rowlands LA, Aitken ME, Jacobs RF. Impact of a waiting room videotape message on parent attitudes toward pediatric antibiotic use. *Pediatrics.* 2001;108(3):591-596.
175. Wright SM, Hedin SC, McConnell M, et al. Using Shared Decision-Making to Address Possible Overtreatment in Patients at High Risk for Hypoglycemia: The Veterans Health Administration’s Choosing Wisely Hypoglycemia Safety Initiative. *Clin Diabetes.* 2018;36(2):120-127. doi:10.2337/cd17-0060
176. F. A, J.M. B, J. V, et al. Mandatory second opinion to reduce rates of unnecessary caesarean sections in Latin America: A cluster randomised controlled trial. *Lancet.*

- 2004;363(9425):1934-1940. doi:<http://dx.doi.org/10.1016/S0140-6736%2804%2916406-4>
177. Ashurst J. Effect of Triage-Based Use of the Ottawa Foot and Ankle Rules on the Number of Orders for Radiographic Imaging. *J Am Osteopath Assoc*. 2014;114(11):890. doi:10.7556/jaoa.2014.184
  178. Barker A, Verhoeven K, Ahsan M, et al. ID: 25: SOCIAL DETERMINANTS OF PATIENT ANTIBIOTIC MISUSE IN HARYANA, INDIA. *J Investig Med*. 2016;64(4):935.1-935. doi:10.1136/jim-2016-000120.49
  179. Blackmore CC, Mecklenburg RS, Kaplan GS. At Virginia Mason, collaboration among providers, employers, and health plans to transform care cut costs and improved quality. *Health Aff*. 2011;30(9):1680-1687. doi:10.1377/hlthaff.2011.0291
  180. Canadian Psychiatric Association. Thirteen Things Physicians and Patients Should Question. Choosing Wisely . <https://choosingwiselycanada.org/wp-content/uploads/2017/02/Psychiatry.pdf>. Accessed April 9, 2019.
  181. Cho HJ, Wray CM, Maione S, et al. Right Care in Hospital Medicine: Co-creation of Ten Opportunities in Overuse and Underuse for Improving Value in Hospital Medicine. *J Gen Intern Med*. 2018;804-806. doi:10.1007/s11606-018-4371-4
  182. Chow SL, Carter Thorne J, Bell MJ, et al. Choosing Wisely: The Canadian Rheumatology Association’s List of 5 Items Physicians and Patients Should Question. *J Rheumatol*. 2015;42(4):682-689. doi:10.3899/jrheum.141140
  183. Goggin K, Bradley-Ewing A, Myers AL, et al. Protocol for a randomised trial of higher versus lower intensity patient-provider communication interventions to reduce antibiotic misuse in two paediatric ambulatory clinics in the USA. *BMJ Open*. 2018;8(5):1-10. doi:10.1136/bmjopen-2017-020981
  184. Gonzales R, Corbett KK, Leeman-Castillo BA, et al. The “Minimizing Antibiotic Resistance in Colorado” Project: Impact of Patient Education in Improving Antibiotic Use in Private Office Practices. *Health Serv Res*. 2005;40(1):101-116. doi:10.1111/j.1475-6773.2005.00344.x
  185. Ho T, Dukhovny D, Zupancic JAF, Goldmann DA, Horbar JD, Pursley DM. Choosing Wisely in Newborn Medicine: Five Opportunities to Increase Value. *Pediatrics*. 2015;136(2):e482-e489. doi:10.1542/peds.2015-0737
  186. Lee IT, Di Capua J, Cho HJ. Considering Cocreation for the Choosing Wisely List. *Acad Med*. 2017;92(5):576. doi:10.1097/ACM.0000000000001644
  187. Lemiengre MB, Verbakel JY, Burghgraeve T De, et al. Optimizing antibiotic prescribing for acutely ill children in primary care (ernie2 study protocol, part b): A cluster randomized, Factorial controlled trial evaluating the effect of a point-of-care c-reactive protein test and a brief intervention combined. *BMC Pediatr*. 2014;14(1):1-9. doi:10.1186/1471-2431-14-246
  188. Maratt JK, Kerr EA, Klamerus ML, Lohman SE, Bhatia S, Saini SD. Measures Used to Assess the Impact of Interventions to Reduce Low-Value Care: A Systematic Review of Published and Ongoing Studies. (1):1-64.
  189. Melnick ER, Hess EP, Guo G, et al. Patient-Centered Decision Support: Formative Usability Evaluation of Integrated Clinical Decision Support With a Patient Decision Aid for Minor Head Injury in the Emergency Department. *J Med Internet Res*. 2017;19(5):e174. doi:10.2196/jmir.7846

190. Nguyen GC, Boland K, Afif W, et al. Modified Delphi Process for the Development of Choosing Wisely for Inflammatory Bowel Disease. *Inflamm Bowel Dis*. 2017;23(6):858-865. doi:10.1097/MIB.0000000000001152
191. Omaki E, Castillo R, Eden K, et al. Using m-health tools to reduce the misuse of opioid pain relievers. *Inj Prev*. 2017;1-6. doi:10.1136/injuryprev-2017-042319
192. Porath JD, Meka AP, Morrow C, et al. Patient Preferences for Diagnostic Testing in the Emergency Department: A Cross-sectional Study. *Acad Emerg Med*. 2018;25(6):627-633. doi:10.1111/acem.13404
193. Saini V, Rice S. "We have to include and involve patients in the decisionmaking". *Mod Healthc*. 2016;46(23):44-45.
194. Shorten A, Chamberlain M, Shorten B, Kariminia A. Making choices for childbirth: Development and testing of a decision-aid for women who have experienced previous caesarean. *Patient Educ Couns*. 2004;52(3):307-313. doi:10.1016/S0738-3991(03)00106-X
195. Stepanczuk C, Williams N, Morrison K, Kemmerer C. Factors influencing patients' receptiveness to evidence-based recommendations during the clinical encounter. *J Comp Eff Res*. 2017;6(4):347-361. doi:10.2217/ce-2016-0077
196. Trojanowski J, Eber L, Trojanowski J, et al. Why Won't Antibiotics Be Used? Developing Tools for Education and Communication Concerning Suspected UTI in Long Term Care (LTC). A Project of the Colorado Long Term Care Research Partnership. *J Am Med Dir Assoc*. 2018;19(3):B23. doi:10.1016/j.jamda.2017.12.072
197. Bosslet GT, Pope TM, Rubenfeld GD, et al. An official ATS/AACN/ACCP/ESICM/SCCM policy statement: Responding to requests for potentially inappropriate treatments in intensive care units. *Am J Respir Crit Care Med*. 2015;191(11):1318-1330. doi:10.1164/rccm.201505-0924ST
198. Degeling C, Johnson J, Iredell J, et al. Assessing the public acceptability of proposed policy interventions to reduce the misuse of antibiotics in Australia: A report on two community juries. *Health Expect*. 2018;21(1):90-99. doi:10.1111/hex.12589
199. Elshaug AG, Watt A, Moss J, Hiller J. Policy Perspectives on the Obsolescence of Health Technologies in Canada. ... *Drugs Technol Heal*. 2009;(October):29.
200. Scotland I, Database EE. Technologies scoping report. 2013;(16).
201. Hollingworth W, Rooshenas L, Busby J, et al. Using clinical practice variations as a method for commissioners and clinicians to identify and prioritise opportunities for disinvestment in health care: a cross-sectional study, systematic reviews and qualitative study. *Heal Serv Deliv Res*. 2015;3(13):1-172. doi:10.3310/hsdr03130
202. Lee M, Chiu J, Rolko E. Choosing wisely: Experience of a community academic hospital pharmacy in identifying opportunities and implementing changes. *Can J Hosp Pharm*. 2017;70(5):375-380. doi:10.4212/cjhp.v70i5.1699
203. Lenaghan J. Involving the public in rationing decisions. The experience of citizens juries. *Health Policy (New York)*. 1999;49(1-2):45-61. doi:10.1016/S0168-8510(99)00042-1
204. Minogue V, Wells B, Brooks A. Difficult conversations? Engaging patients in reducing waste in health care. *Int J Heal Gov*. 2016;21(2):51-58. doi:10.1108/IJHG-01-2016-0002



205. NHS England. NHS England launches action plan to drive out wasteful and ineffective drug prescriptions, saving NHS over £190 million a year. <https://www.england.nhs.uk/2017/07/medicine-consultation/>. Published 2017. Accessed April 9, 2019.
206. NHS England. *Items Which Should Not Be Routinely Prescribed in Primary Care: Consultation Report of Findings.*; 2017.
207. Nicholls SG, Wilson BJ, Etchegary H, et al. Benefits and burdens of newborn screening: Public understanding and decision-making. *Per Med.* 2014;11(6):593-607. doi:10.2217/pme.14.46
208. McArthur D. A Report of the Ontario Citizens' Council. 2010.
209. Parchman ML, Henrikson NB, Blasi PR, et al. Taking action on overuse: Creating the culture for change. *Healthcare.* 2017;5(4):199-203. doi:10.1016/j.hjdsi.2016.10.005
210. Rychetnik L, Doust J, Thomas R, Gardiner R, MacKenzie G, Glasziou P. A community jury on PSA screening: What do well-informed men want the government to do about prostate cancer screening - A qualitative analysis. *BMJ Open.* 2014;4(4):1-8. doi:10.1136/bmjopen-2013-004682
211. Seo HJ, Park JJ, Lee SH. A systematic review on current status of health technology reassessment: Insights for South Korea. *Heal Res Policy Syst.* 2016;14(1). doi:10.1186/s12961-016-0152-x
212. Vernazza CR, Carr K, Wildman J, et al. Resource allocation in NHS dentistry: Recognition of societal preferences (RAINDROP): Study protocol. *BMC Health Serv Res.* 2018;18(1):1-7. doi:10.1186/s12913-018-3302-8
213. Watt AM, Hiller JE, Braunack-Mayer AJ, et al. The ASTUTE Health study protocol: Deliberative stakeholder engagements to inform implementation approaches to healthcare disinvestment. *Implement Sci.* 2012;7(1):101. doi:10.1186/1748-5908-7-101
214. Korenstein D, Keyhani S, Troy A, Lipitz-Snyderman A, Chimonas S, Barrow B. Development of a Conceptual Map of Negative Consequences for Patients of Overuse of Medical Tests and Treatments. *JAMA Intern Med.* 2018;178(10):1401. doi:10.1001/jamainternmed.2018.3573
215. Sypes EE, de Grood C, Parsons Leigh J, Clement FM, Stelfox HT, Niven DJ. Understanding the role of the public in reducing low-value care: A Scoping Review. *Under peer Rev.*
216. Institute JB. Joanna Briggs Institute Reviewers' Manual. *Adelaide, SA Joanna Briggs Inst.* 2011.
217. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement David Moher and colleagues introduce PRISMA, an update of the QUOROM guidelines for reporting systematic reviews and meta-analyses , for the PRISMA Group. doi:10.1136/bmj.b2535
218. Higgins JPT, Altman DG, Gotzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ.* 2011;343(oct18 2):d5928-d5928. doi:10.1136/bmj.d5928
219. Downs SH, Black N. *The Feasibility of Creating a Checklist for the Assessment of the Methodological Quality Both of Randomised and Non-Randomised Studies of*

- Health Care Interventions*. Vol 52.; 1998.
220. Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ*. 2003;327(7414):557-560. doi:10.1136/bmj.327.7414.557
  221. Hemo B, Shamir-Shtein NH, Silverman BG, et al. Can a nationwide media campaign affect antibiotic use? *Am J Manag Care*. 2009;15(8):529-534.
  222. Liu C, Desai S, Krebs LD, Kirkland SW, Keto-Lambert D, Rowe BH. Effectiveness of Interventions to Decrease Image Ordering for Low Back Pain Presentations in the Emergency Department: A Systematic Review. *Acad Emerg Med*. 2018;25(6):614-626. doi:10.1111/acem.13376
  223. Buist D. Primary Care Clinicians' Perspectives on Reducing Low-Value Care in an Integrated Delivery System. *Perm J*. 2015;20(1):41-46. doi:10.7812/TPP/15-086
  224. Boote J, Baird W, Beecroft C. Public involvement at the design stage of primary health research: A narrative review of case examples. *Health Policy (New York)*. 2010;95(1):10-23. doi:10.1016/J.HEALTHPOL.2009.11.007
  225. Haynes RB, Devereaux PJ, Guyatt GH. Physicians' and patients' choices in evidence based practice. *BMJ*. 2002;324(7350):1350.
  226. Scheunemann LP, Ernecoff NC, Buddadhumaruk P, et al. Clinician-Family Communication About Patients' Values and Preferences in Intensive Care Units. *JAMA Intern Med*. April 2019. doi:10.1001/jamainternmed.2019.0027
  227. Haesebaert J, Adekpedjou R, Croteau J, Robitaille H, Légaré F. Shared decision-making experienced by Canadians facing health care decisions: a Web-based survey. *C Open*. 2019;7(2):E210-E216. doi:10.9778/cmajo.20180202