A Review of Empirical Analyses of Disinvestment Initiatives

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ABSTRACT

Background: Disinvesting in low-value health care services provides opportunities for investment in higher value care and thus an increase in health care efficiency. Objectives: To identify international experience with disinvestment initiatives and to review empirical analyses of disinvestment initiatives. Methods: We performed a literature search using the PubMed database to identify international experience with disinvestment initiatives. We also reviewed empirical analyses of disinvestment initiatives. Results: We identified 26 unique disinvestment initiatives implemented across 11 countries. Nineteen addressed multiple intervention types, six addressed only drugs, and one addressed only devices. We reviewed 18 empirical analyses of disinvestment initiatives: 7 reported that the initiative was successful, 8 reported that the initiative was unsuccessful, and 3 reported that findings were mixed; that is, the study considered multiple services and reported a decrease in the use of some but not others. Thirty-seven low-value services were evaluated across the 18 empirical analyses, for 14 (38%) of which the disinvestment initiative led to a decline in use. Six of the seven studies that reported the disinvestment initiative to be successful included an attempt to promote the disinvestment initiative among participating clinicians. Conclusions: The success of disinvestment initiatives has been mixed, with fewer than half the identified empirical studies reporting that use of the low-value service was reduced. Our findings suggest that promotion of the disinvestment initiative among clinicians is a key component to the success of the disinvestment initiative. Keywords: disinvestment, health care efficiency, low-value care, resource allocation.

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Introduction

Health technology assessment (HTA) agencies have conventionally evaluated the effectiveness and cost-effectiveness of new technologies to determine whether a health care system should invest in them [1]. Nevertheless, observers argue that by focusing efforts on assessing new technologies, rather than on broader efficiency questions, HTA agencies have contributed to increases in health care expenditures and pressure on health care budgets [2,3].

Health care systems across the globe are increasingly recognizing that to control health care costs it is necessary to complement judicious investment in new health care technology with strategies to reduce the use of unnecessary, ineffective, inefficient, or harmful care [4]. These strategies, commonly referred to as “disinvestment initiatives,” have been defined as the partial or complete withdrawal of health resources from existing health care practices, procedures, technologies, or drugs that are deemed to deliver little or no health gain for their cost [5]. Reducing spending on low-value care provides opportunities for a health care system to invest in higher value care and thus to increase health care efficiency.

The introduction of new technologies will increase health care system efficiency only if the introduced technologies displace less cost-effective practices. Historically, health care systems have relied on “passive” disinvestment—or natural attrition—to reduce use of low-value or inappropriate care [4]. In other words, policymakers have assumed that in response to the introduction of new and effective technologies, clinicians will modify their practice and stop using, or use less frequently, existing less effective or cost-effective alternatives. There are a range of levers that exist to guide the use for new and existing technologies—including clinical guidelines and clinical support tools—but there is a growing consensus that existing approaches are insufficient, and that hurdles such as the entrenchment of low-value services in clinical practice and other biases hinder the reduction of ineffective, inefficient, unnecessary, or harmful care [6–9].

Health care systems in various countries have experimented with a range of active disinvestment initiatives to address low-value services. Among these initiatives is the National Institute for Health and Care Excellence’s (NICE’s) “do not do” list of low-value interventions in the United Kingdom and the Choosing Wisely Campaign that has been implemented in the United States and other countries to encourage a reduction in the use of wasteful or unnecessary medical tests, procedures, and treatments [4,10,11]. This experimentation has not led, however, to a single widely

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accepted or validated approach, or to a consensus on what leads to a successful disinvestment initiative. We examined the success of disinvestment strategies by reviewing empirical evaluations of disinvestment initiatives implemented by health care systems across the globe. Our study had two objectives: 1) to sample the literature to identify and describe disinvestment initiatives implemented by health care systems in various countries and 2) to review empirical evaluations of disinvestment initiatives to examine their success in reducing the use of low-value services.

**Methods**

**Study Objective 1: Identifying International Disinvestment Initiatives**

We searched the PubMed database to sample the literature for studies that described disinvestment initiatives published through May 5, 2016, using the following search terms: “disinvestment,” “decommission,” “delist,” “health technology reassessment,” “low-value,” “marginal value,” “reallocation,” “resource allocation,” and “resource management.” We limited our search to studies in English and did not restrict study inclusion on the basis of publication date. We used the same search terms to search on Internet search engines. We also searched the gray literature—including government documents and academic working papers—for pertinent studies.

We included studies that described or evaluated national disinvestment initiatives that addressed any type of health care service, including drugs, medical devices, diagnostic imaging and screening tests, surgical procedures, and so on. We excluded strategies that were not national disinvestment initiatives, for example, those limited to individual hospitals. We also excluded studies that described program budgeting and marginal analysis programs because although this technique considers simultaneous investment and disinvestment of health care interventions or programs, it did not meet our definition of a disinvestment initiative.

**Study Objective 2: Reviewing Empirical Evaluations of Disinvestment Initiatives**

We reviewed the studies that met the criteria as outlined in study objective 1 to determine those that were empirical analyses of disinvestment initiatives, that is, those that compared the use of a low-value service before and after the implementation of the disinvestment initiative. We evaluated each empirical study that met our inclusion criteria. First, we determined what disinvestment initiative was being evaluated and its setting. Second, we determined whether the disinvestment initiative was mixed. In all, the 18 studies evaluated 37 low-value services, for 14 (38%) of which the disinvestment initiative led to a decline in use.

**Results**

**Study Objective 1: Identifying International Experience with Disinvestment Initiatives**

We identified 26 unique disinvestment initiatives implemented from 1984 to 2014 (Table 1). Eighteen initiatives (69%) were established in 2005 or more recently, including 10 (38%) established in 2010 or more recently. Nineteen initiatives addressed multiple intervention types, six addressed only drugs, and one addressed only devices.

One initiative, the Choosing Wisely Campaign, has been implemented in six countries. Australia (seven initiatives), the United Kingdom (six initiatives), and New Zealand (three initiatives) have implemented the most disinvestment initiatives. Twenty-five initiatives were implemented in a single country.

**Choosing Wisely Campaign**

In 2012, the American Board of Internal Medicine launched the Choosing Wisely Campaign to help providers and patients engage in conversations about avoiding the use of unnecessary treatments, tests, and procedures [10]. The campaign was developed in conjunction with 20 medical specialty professional organizations, each of which generated a list of five interventions that they considered to be overused in their field.

**NICE initiatives**

NICE is an executive nondepartmental public body of the Department of Health in the United Kingdom. Among its roles is to provide recommendations on care that should or should not be used in the National Health Service [12]. NICE’s recommendations regarding low-value care can originate in various sources including clinical guidelines and in HTAs that are informed through review of clinical and cost-effectiveness evidence and input from stakeholders [13,14].

**US Preventive Services Task Force**

The USPSTF is an independent panel of experts in primary care and prevention [15]. The task force reviews evidence of an intervention’s effectiveness to develop evidence-based recommendations for clinical preventive services intended for use by health care professionals and patients. It uses a grading scheme to summarize its recommendations [16]. The task force uses a grade D to recommend against a service in which there is moderate or high certainty that the service has no net benefit.

**Success of Disinvestment Initiatives**

Seven (39%) studies reported that the disinvestment initiative was successful, eight (44%) reported that the initiative was unsuccessful, and three (17%) reported that the success of the initiative was mixed. In all, the 18 studies evaluated 37 low-value services, for 14 (38%) of which the disinvestment initiative led to a decline in use.
Five of the nine empirical studies that evaluated Choosing Wisely recommendations reported the disinvestment initiative to be successful, two reported the initiative to be unsuccessful, and two reported the success of the initiative to be mixed. Nineteen interventions were examined in the nine empirical studies that evaluated Choosing Wisely recommendations, for nine (47%) of which the disinvestment initiative led to a decline in use.

Two of the eight empirical studies that evaluated disinvestment initiatives promulgated by NICE reported the disinvestment initiative to be successful, five reported the initiative to be unsuccessful, and one reported the success of the initiative to be mixed. Seventeen interventions were examined in the nine empirical studies that evaluated initiatives promulgated by NICE, for five (47%) of which the disinvestment initiative led to a decline in use.

The study that evaluated the USPSTF grade D recommendations reported that it did not reduce the use of the low-value service (routine mammography screening in women younger than 50 years).

Study Characteristics
Seventeen studies reported the follow-up period postimplementation of the disinvestment initiative: the median period was 12 months (range 1–72 months). Studies reporting initiatives to be successful had a median follow-up of 6 months (range 1–12 months), studies reporting initiatives to be unsuccessful had a median follow-up of 24 months (range 3–72 months), and studies reporting the success of the initiatives to be mixed had a median follow-up of 11 months (range 6–15 months).

Four of the 18 reviewed studies included a phase-in period, of which 3 (75%) reported that the initiative was successful. Of the 14 studies without a phase-in period, 4 (29%) reported the initiative to be successful, 7 (50%) reported the initiative to be unsuccessful, and 3 (21%) reported mixed success.

Two of the 18 reviewed studies included control groups, of which 1 reported the initiative to be successful. Of the 16 studies without a control group, 6 reported the initiative to be successful, 8 reported the initiative to be unsuccessful, and 2 reported the success of the initiative to be mixed.

Seven of the 18 reviewed studies included a formal attempt to promote the disinvestment initiative, of which 6 reported the initiative to be successful and 1 reported that the initiative was a mixed success. One of the 11 studies without a formal attempt to promote the disinvestment initiative reported the initiative to be successful, 8 reported the initiative to be unsuccessful, and 2 reported mixed success.

Discussion
We identified widespread experimentation of disinvestment initiatives, with 26 initiatives implemented in 11 countries. More than one-third of these initiatives were established in the last 5 years, suggesting a growing recognition of the need to reduce the use of unnecessary, ineffective, inefficient, or possibly harmful care [4].
### Table 2 - Empirical studies evaluating disinvestment initiatives.

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Low-value intervention(s) (date of guidance/recommendation)</th>
<th>Control</th>
<th>Data source(s)</th>
<th>Sample size</th>
<th>Time period</th>
<th>Phase-in period</th>
<th>Promotion of the disinvestment initiative</th>
<th>Details of the outcome of the disinvestment initiative</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corson et al., 2015</td>
<td>United States</td>
<td>Common laboratory tests: CBC, basic metabolic panels, nutrition panel, comprehensive metabolic panel (February 2013)</td>
<td>None</td>
<td>Electronic medical record</td>
<td>13,583 patients</td>
<td>Pre-initiative: 10 mo Wash-in: 1 mo Postinitiative: 7 mo</td>
<td>1 mo</td>
<td>Multifaceted QI initiative, including: Monthly email Monthly reporting of provider behavior</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Choosing Wisely</td>
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<td></td>
<td>↓ Total no. of common laboratory tests ordered per patient-day, 2.06 vs. 1.76 (P &lt; 0.01) ↓ CBC labs (P &lt; 0.01) ↓ Basic metabolic panel (P &lt; 0.01) ↓ Nutritional panel (P = 0.01) ↓ Comprehensive metabolic panel (P &lt; 0.01)</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Gebhardt et al., 2015</td>
<td>United States</td>
<td>Radiation therapy with &gt;10 fraction regimens for pain relief from bone metastases (September 2013)</td>
<td>None</td>
<td>Medical records</td>
<td>12,678 treatment courses</td>
<td>Baseline: 9 y Follow-up: 1 y</td>
<td>None</td>
<td>Online clinical pathway system (decision support tool) ↓ Extended fraction regimens (&gt;10) overall from 18.6% to 9.7% (P &lt; 0.0001)</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Kost et al., 2015</td>
<td>United States</td>
<td>1. Imaging for low-back pain within the first 6 wk 2. Antibiotic prescribing for mild-moderate sinusitis 3. Pap tests on women &lt;21 y old or have had hysterectomy for noncancerous disease 4. Annual electrocardiogram screenings for low-risk patients 5. DXA scanning for osteoporosis in women &lt;65 y or men &lt;70 y with no risk factors (April 2012)</td>
<td>None</td>
<td>Chart review</td>
<td>1,089 patient charts</td>
<td>Pre-initiative: 6 mo Postinitiative: 6 mo</td>
<td>None</td>
<td>Either a 1-h seminar or an online webinar reviewing the recommendations ↓ 1. No change in low-back pain imaging (P = 0.99) ↓ 2. ↓ in prescribing antibiotics for sinusitis (P &lt; 0.01) ↓ 3. No change in Pap tests in women &lt;21 y (P = 0.55) ↓ 4. No change in ECGs for low-risk patients (P = 0.96) ↓ 5. ↓ in DXA screening (P = 0.049)</td>
<td>Mixed</td>
<td></td>
</tr>
<tr>
<td>Lasser et al., 2016</td>
<td>United States</td>
<td>DXA screening for osteoporosis in women &lt;65 y with no risk factors (April 2012)</td>
<td>None</td>
<td>Electronic medical records</td>
<td>42,320 patients</td>
<td>Pre-initiative: 9 mo Postinitiative: 9 mo</td>
<td>None</td>
<td>↓ Average provider DXA order rate per patient (2.6% pre to 2.0% post) (P = 0.75)</td>
<td>No</td>
<td></td>
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<tr>
<td>Lesuis et al., 2016</td>
<td>Netherlands</td>
<td>Antinuclear antibody testing for new patients with rheumatology (February 2013)</td>
<td>None</td>
<td>Laboratory and administrative hospital databases</td>
<td>11,939 tests pre-initiative = 6,514 Postinitiative = 5,425</td>
<td>Pre-initiative: 12 mo Postinitiative: 12 mo</td>
<td>None</td>
<td>↓ No of antinuclear antibody testing Center 1 and 2 (0.37 to 0.11) (P &lt; 0.01) Center 3 (0.45 to 0.30) (P &lt; 0.01)</td>
<td>Yes</td>
<td></td>
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<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Tests</th>
<th>Reports</th>
<th>Database</th>
<th>Patients</th>
<th>Pre-initiative</th>
<th>Post-initiative</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverenz et al., 2015 [29]</td>
<td>United States</td>
<td>Common laboratory tests: daily CBC or basic metabolic panels (February 2013)</td>
<td>None</td>
<td>Hospital laboratory database</td>
<td>Not reported</td>
<td>Not reported</td>
<td>None</td>
<td>Distribution of an evidence-based flier ● Presentation of data at house staff conferences ● Weekly email reminder/feedback ● Monthly report on rate of laboratory tests</td>
</tr>
<tr>
<td>Rosenberg et al., 2015 [30]</td>
<td>United States</td>
<td>Imaging for uncomplicated headaches 1. Imaging for cardiac conditions for patients without history of cardiac conditions 2. Imaging for low-back pain without red-flag conditions 3. Preoperative chest x-rays with unremarkable history and physical examination results 4. HPV testing for women &lt;30 y 5. HAPEY testing for heart failure, chronic kidney disease (April 2012)</td>
<td>None</td>
<td>Claims data</td>
<td>25 million members</td>
<td>Pre-initiative: 27 mo Post-initiative: 15 mo</td>
<td>None</td>
<td>1. ↓ use of imaging for headache (P &lt; 0.001) 2. ↓ cardiac imaging (P &lt; 0.001) 3. No change in imaging for low-back pain (P = 0.71) 4. No change in use of preoperative chest x-rays (P = 0.70) 5. ↑ in HPV testing in younger women (P &lt; 0.001) 6. No change in use of antibiotics for sinusitis (P = 0.16) 7. ↑ in use of NSAIDs (P &lt; 0.001)</td>
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<tr>
<td>Schondelmeyer et al., 2015 [39]</td>
<td>United States</td>
<td>CPOX for hospitalized children with respiratory illness (February 2013)</td>
<td>None</td>
<td>Chart review</td>
<td>617 patients (intervention unit = 455; control unit = 162)</td>
<td>Baseline: 3 mo Follow-up: 3 mo</td>
<td>None</td>
<td>• Education ● Checklist used during nurse hand-off ● Discontinuation criteria incorporated into order set ↓ in median time per week on CPOx (baseline 10.7 h to 3.1 h) (statistical significance not reported) Yes</td>
</tr>
<tr>
<td>Simos et al., 2014 [31]</td>
<td>Canada</td>
<td>Imaging for metastatic disease in asymptomatic patients with early-stage breast cancer (April 2012)</td>
<td>None</td>
<td>Medical records</td>
<td>200 patients</td>
<td>Pre-initiative: 1 y Wash-in period: 4 mo Post-initiative: 3 mo</td>
<td>4 mo</td>
<td>No change in % of patients who received imaging for distant metastases not keeping with guidelines (77% pre to 75% post) (statistical significance not reported) No</td>
</tr>
<tr>
<td>Chamberlain et al., 2013 [32]</td>
<td>United Kingdom</td>
<td>1. Endometrial biopsies in the luteal phase to investigate female infertility (February 2004) 2. Varicocele operations to treat infertility in men (February 2004)</td>
<td>None</td>
<td>National hospital episode statistics</td>
<td>137,028 admissions for female infertility 2. 9,399 consultant episodes for male infertility</td>
<td>Preguidance: 6 y Postguidance: 6 y</td>
<td>None</td>
<td>1. ↑ endometrial biopsies (APC 6.0% [95% CI 3.6% to 8.4%] up to 2003; APC 1.5% [95% CI –4.3% to 7.7%] up to 2007; and APC 12.8% [95% CI 1.0% to 26.0%] up to 2010) 2. No change in varicocele procedures (APC –0.5% [95% CI –2.3% to 1.3%])</td>
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<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Low-value intervention(s) (date of guidance/recommendation)</th>
<th>Control</th>
<th>Data source(s)</th>
<th>Sample size</th>
<th>Time period</th>
<th>Phase-in period</th>
<th>Promotion of the disinvestment initiative</th>
<th>Details of the outcome of the disinvestment initiative</th>
<th>Success</th>
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</thead>
<tbody>
<tr>
<td>Coronini-Cronberg et al., 2014 [33]</td>
<td>United Kingdom</td>
<td>1. Spinal surgery for lower back pain</td>
<td>Coronary revascularization; cholecystectomy</td>
<td>National hospital episode statistics</td>
<td>5,248,808 procedures</td>
<td>Pre-initiative: 8 y</td>
<td>None</td>
<td>None</td>
<td>3. † planned cesarean sections in women with hepatitis, compared with women without (APC 4.0% [95% CI 2.7% to 5.3%] up to 2001; APC −0.6% [95% CI −2.8% to 1.8%] up to 2004; and APC 1.3% [95% CI 0.8% to 1.8%] up to 2010)</td>
<td>Mixed</td>
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<td>2. Myringotomy to relieve eardrum pressure</td>
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<td>Postinitiative: 1 y</td>
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<td></td>
<td>1. No change in spinal surgery</td>
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<td>3. Inguinal hernia repair</td>
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<td>2. ↓ myringotomies (by 11.4%) (P &lt; 0.05)</td>
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<td>4. Cataract removal</td>
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<td>3. ↑ in hernia repair (P &lt; 0.05)</td>
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<td>5. Primary hip replacement</td>
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<td>4. ↓ in cataract removal (by 4.8%) (P &lt; 0.05)</td>
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<td>6. Hysterectomy for heavy menstrual bleeding</td>
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<td>5. ↓ in hysterectomies (by 10.7%) (P &lt; 0.05)</td>
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<td>3. Cesarean sections in women with hepatitis (April 2004)</td>
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<td></td>
<td>† from 10 million items dispensed in 2000 to 22 million in 2004 (statistical significance not reported)</td>
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<tr>
<td>Dietrich, 2009 [34]</td>
<td>United Kingdom</td>
<td>21 drugs subject to negative and restricting NICE technology appraisal (2001–2004)</td>
<td>None</td>
<td>National prescribing data</td>
<td>10 million &quot;low-value&quot; items dispensed in 2000; 22 million dispensed in 2004</td>
<td>Pre-initiative: 4 y</td>
<td>None</td>
<td>None</td>
<td>Hope Hospital (significance not reported): • ↓ in SKR use (37% to 4%) • ↓ in CT % scan (higher value) • ↓ in admissions (9% to 4%)</td>
<td>No</td>
</tr>
<tr>
<td></td>
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<td>SXR and observation/admission as the first investigation in head injury management (June 2003)</td>
<td>CT scan Patient records</td>
<td>1,130 patients with head injury</td>
<td>Baseline: 1 mo Wash-in period: 1 mo Follow-up: 1 mo</td>
<td>Postinitiative: 1 y</td>
<td></td>
<td></td>
<td>North Tyneside General Hospital = &quot;intensive ED education and promotion exercise&quot; Hope Hospital = &quot;disseminated ED protocol&quot;</td>
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<tr>
<td>Hassan et al., 2005 [35]</td>
<td>United Kingdom</td>
<td>SXR and observation/admission as the first investigation in head injury management (June 2003)</td>
<td>CT scan Patient records</td>
<td>1,130 patients with head injury</td>
<td>Baseline: 1 mo Wash-in period: 1 mo Follow-up: 1 mo</td>
<td>Postinitiative: 1 y</td>
<td></td>
<td></td>
<td>North Tyneside General Hospital: • ↓ in CT scans (1.4% to 9%) • ↓ in SXR use (19% to 0.5%) • ↓ in admissions (7% to 5%) (statistical significance not reported)</td>
<td>No</td>
</tr>
<tr>
<td>Okagbue et al. [19]</td>
<td>United Kingdom</td>
<td>ECT for non-life-threatening illness (May 2003)</td>
<td>None</td>
<td>Patient records</td>
<td>1,071 patients</td>
<td>Pre-initiative: 10 y</td>
<td>None</td>
<td>None</td>
<td>No early effect of the guidance was found in the rate of ECT usage</td>
<td>No</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Intervention</th>
<th>Setting</th>
<th>Outcome</th>
<th>Data Collection</th>
<th>Pre-Initiative</th>
<th>Post-Initiative</th>
<th>Findings</th>
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</thead>
<tbody>
<tr>
<td>Ryan et al., 2004 [36]</td>
<td>United Kingdom</td>
<td>Extraction of pathology-free impacted third molars (March 2000)</td>
<td>CHKS hospital episode database</td>
<td>14,545 impacted wisdom teeth extractions</td>
<td>Pre-initiative: 3 y Postinitiative: 2 y</td>
<td>↓ No. of impacted teeth extractions (effect of NICE guidance not significant, ( P = 0.8287 ))</td>
<td></td>
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<tr>
<td>Sheldon et al. [40]</td>
<td>United Kingdom</td>
<td>Extraction of pathology-free impacted third molars (April 2000)</td>
<td>Case notes, survey, interviews</td>
<td>6,308 usable patient audit forms</td>
<td>Pre-initiative: 5 y Postinitiative: 2 y</td>
<td>No change in the number of extractions, although no evidence that decline was due to NICE guidance (5.8%, ( P = 0.9124 ))</td>
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<tr>
<td>Thornhill et al., 2011 [37]</td>
<td>United Kingdom</td>
<td>Antibiotic prophylaxis (prevention of infective endocarditis) for dental procedures (March 2008)</td>
<td>National prescribing data</td>
<td>13,019 prescriptions</td>
<td>Pre-initiative: 12 mo Postinitiative: 12 mo</td>
<td>↓ in mean prescriptions (78.6%) in prescribing of antibiotic prophylaxis by dentists (79.9%, ( P &lt; 0.001 ))</td>
<td></td>
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</tr>
<tr>
<td>Dehkhordy et al., 2015 [38]</td>
<td>United States</td>
<td>Routine mammography screening in women &lt; 50 y (November 2009)</td>
<td>Population-level data from the Behavioral Risk Factor Surveillance System (self-report data)</td>
<td></td>
<td>USPSTF</td>
<td>Comparison 12 mo before USPSTF recommendation</td>
<td>↑ rate of screening initiation at age 40 y (( P = 0.012 ))</td>
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</table>

**Notes:**
- APC, annual percentage change; CBC, complete blood cell count; CI, confidence interval; CT, computed tomography; CPOx, continuous pulse oximetry; DXA, dual-energy x-ray absorptiometry; ECG, electrocardiogram; ECT, electroconvulsive therapy; ED, emergency department; HPV, human papilloma virus; NICE, National Institute of Health and Care Excellence; NSAID, nonsteroidal anti-inflammatory drug; QI, quality improvement; SXR, skull x-ray; USPSTF, US Preventive Services Task Force.
- *There were three time periods in this study: 5 y of baseline data were collected for an initial clinical pathway; 4 y of additional baseline data were collected for a modified clinical pathway that included peer review; and “postinitiative” follow-up data were collected 1 y after the pathway was modified to reflect the Choosing Wisely guideline.
- † Time period of study was reported in yearly quarters. Pre-initiative data were collected for nine quarters (assumed to be 27 mo) and postinitiative data were collected for five quarters (assumed to be 15 mo).
- ‡ Study compared physicians who had received an intervention to encourage adherence to the guideline to a control group of physicians (those who did not receive the intervention).
- § \( P \) values were reported for other results including for the change in the number of at least one imaging test for distant metastatic disease (% of total) from 83% prerecommendation and 86% postrecommendation (\( P = 0.70 \)).
Nevertheless, despite these efforts, we found few empirical analyses of disinvestment initiatives. Reasons for this are unclear. Possibly, insufficient time has passed for researchers to have performed and published empirical analyses. It may also be that the agencies that implemented the initiatives have not published the evaluations they have performed.

The empirical studies we reviewed reported that the studied disinvestment initiatives had varied success in reducing the use of the low-value service(s). Fewer than half of the studies (39%) reported that the disinvestment initiative was successful and the remaining reported the initiatives to be either unsuccessful (44%) or of mixed success (17%). This finding was consistent when we considered low-value services individually; of the 37 low-value services studied, the disinvestment initiative reduced the use of only 14 (38%).

Although our sample size was insufficient to draw firm conclusions on the necessary components of a successful disinvestment initiative or the types of intervention most amenable to disinvestment, our study provides an insight into why some disinvestment initiatives were successful while others were not.

Primarily, our findings suggest that the incorporation of accompanying strategies to promote the disinvestment initiatives among participating practitioners is key to their success. Six of the seven studies that promoted the initiative were reported to be successful. In contrast, only 1 of the 11 studies that did not include promotion was reported to be unsuccessful. The approaches to promote initiatives and encourage adherence included clinician education, email reminders, feedback on recent prescribing behavior, and online clinical decision support tools. Leverenz et al. report a study in which multiple promotional activities were used to support a disinvestment initiative that successfully reduced the use of common laboratory tests in a university hospital. The promotional activities included the distribution of a flyer before the start of the initiative, a presentation to participating physicians, a weekly email providing feedback on individual-level prescribing behavior, and a monthly email identifying the clinical team that ordered the fewest common laboratory tests. In a second study that included multiple promotional activities, Schondelmeyer et al. [39] reported a disinvestment initiative that successfully reduced the use of continuous pulse oximetry for hospitalized children with respiratory illness. The promotional activities included staff education at initiative outset, communication between clinical team members through a nursing hand-off tool, feedback on the use of continuous pulse oximetry at biweekly and monthly meetings, and weekly email updates to compare the performance of participating clinical teams. Although our study does not indicate a specific “best practice,” it does suggest that promotional efforts that complement disinvestment initiatives are essential.

Four low-value services were evaluated by two separate empirical studies and provide further indication of the influence of promotion. For two of these low-value services—bone densitometry screening for osteoporosis in women younger than 65 years and antibiotics for treatment of acute sinusitis—one of the empirical studies included promotion of the disinvestment initiative to participating clinicians, whereas the other did not; in both instances, the study that included promotion was successful and the one without promotion was not. Both studies that evaluated initiatives to decrease the number of common laboratory tests ordered included some promotion of the disinvestment initiative and reported the initiative to be successful. Both studies that evaluated initiatives to decrease extractions of pathology-free molars did not include promotion of the disinvestment initiative and reported the initiative to be unsuccessful.

With centralized approaches for assessing the effectiveness and cost-effectiveness of interventions and the ability to more readily implement policies across the health care system, it is asserted that single-payer health care systems such as the National Health Service in the United Kingdom may be best positioned to implement disinvestment initiatives [17]. Our findings do not support this assertion. Only two of the eight disinvestment studies that evaluated NICE initiatives in the United Kingdom were reported to be successful. In contrast, four of the eight studies that evaluated disinvestment initiatives in the United States were reported to be successful, despite the country’s fragmented health care system [18]. Nevertheless, the small number of studies in our review prevents firm conclusions to be drawn regarding whether single-payer health care systems are best positioned to successfully implement disinvestment initiatives.

Study Limitations

Our study has a number of limitations. First, because PubMed was the only database we searched, this study should be considered a sampling of the literature rather than a systematic review. Furthermore, because we relied on studies in English when searching the PubMed database and the gray literature, we may have introduced language bias into the study and thus may not have comprehensively accounted for all examples of disinvestment initiatives. Second, the reviewed empirical studies varied with respect to study design, which limited our ability to compare them. For instance, we found that four studies included a study phase-in period, three of which were successful. In comparison, 4 of the 14 studies without a phase-in period were successful. Third, only 2 of the 18 studies included a control group. The lack of a control group raises concerns that an observed change in behavior may be due to environmental influences or factors other than the disinvestment initiative. Fourth, the included studies were performed over different durations. Indeed, the authors of one study suggested that a longer study duration was required to fully understand the initiative’s long-term effect [59]. Fifth, the reviewed studies relied on different data sources, including electronic medical records, physician surveys, chart reviews, and claims data. Sixth, we excluded disinvestment strategies implemented locally. Seventh, although we examined whether the disinvestment initiative resulted in a reduction in the use of the low-value intervention, we did not judge whether the magnitude of the reduction was meaningful. Last, because most of the empirical studies evaluated either NICE or Choosing Wisely Campaign initiatives, the generalizability of our findings regarding the success of disinvestment initiatives may be limited.

Challenges Associated with Disinvestment Strategies

Our findings are consistent with a number of well-documented reported challenges of disinvestment initiatives [8,20]. For instance, researchers suggest that cultural and attitudinal barriers are important hurdles, and that gaining physician acceptance is integral to an initiative’s success [7,21–23]. Two studies supported this assertion by attributing the success of the initiative in part to a clinical setting with a receptive culture, and one study attributed success in part to gaining physician acceptance [24,39,40]. Researchers also point to the importance of adequate resources to support disinvestment initiatives [1,41]. Our findings strongly support this assertion.

We were unable to assess other reported challenges including consumer resistance and problems identifying low-value services [41–43]. Disinvestment initiatives may be less likely to be successful for services that are deeply entrenched in care, although we were unable to judge such matters from the information available.
Looking Forward
How best to allocate scarce health care resources in the face of constrained budgets is a global challenge. Successfully disinvesting in low-value care is necessary to generate the finances required to pay for emerging innovations. It is estimated that as much as one-third of health care spending is wasteful, and disinvesting in low-value care offers great potential to generate much needed health care dollars [44].

Health care systems implementing disinvestment initiatives will look to others’ experiences for lessons. Our study is the first to review empirical evaluations of disinvestment initiatives and provides insights into why some succeed. We found that simply promulgating information regarding which interventions are low-value services may be insufficient to lead to a meaningful reduction in their use and that additional approaches to promote the initiative among participating clinicians should be an integral part of any policy.

More research is necessary to better understand the components of a successful disinvestment initiative. For instance, researchers should examine how long it takes for disinvestment initiatives to have an effect and to explore reasons for our finding that the studies in our sample with a shorter median follow-up were more likely to report that the disinvestment initiative was successful. Researchers should also examine disinvestment strategies implemented locally, for example, at individual hospitals, because these may offer lessons for successful initiatives at the national level. Research that scrutinizes disinvestment strategies implemented locally would have particular relevance to the US health care system, in which, because of its fragmented structure, national-level disinvestment initiatives are challenging to implement [18]. We were unable to draw conclusions as to what types of interventions, that is, drugs, medical procedures, and so forth, are most amenable to disinvestment initiatives. Knowledge of the interventions for which disinvestment would yield the greatest savings would be valuable. Although our findings suggest the need for promotion of the disinvestment initiative to encourage adherence to it, the best approach to achieving this is unclear and in need of study.

Along with the judicious addition of new health care technologies to a health care system, disinvestment of existing low-value services should be part of a coordinated set of approaches to help manage scarce resources. Disinvestment initiatives should continue to support other approaches to help guide the use of technology, including clinical guidelines and clinical decision support tools. Furthermore, demand-side approaches (e.g., patient cost sharing and value-based insurance design), supply-side approaches (e.g., pay for performance and performance-based arrangements), and policies that incorporate behavioral economics (e.g., physician peer comparison) should all be considered as tools for health care systems to manage their scarce resources [7,17,45–49].

Conclusions
Disinvestment initiatives are increasingly being implemented in health care systems around the globe to reduce the use of low-value care. In this sampling of the literature we found that few disinvestment initiatives have been empirically studied, and for those that have, success has been mixed. Our findings suggest that promotion of the disinvestment initiative among participating practitioners is key to the success of the disinvestment initiative.

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