De-implementing Low-Value Care in Cancer Care Delivery: A Systematic Review

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Research

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Abstract

Background

Accumulating evidence suggests that interventions to de-implement low-value services are urgently needed. While medical societies and educational campaigns such as Choosing Wisely have developed several guidelines and recommendations pertaining to low-value care, little is known about interventions that exist to de-implement low-value care in oncology settings. We conducted this review to summarize the literature on interventions to de-implement low-value care in oncology settings, define an agenda for future research, and inform the literature about opportunities for additional work.

Methods

We systematically reviewed the published literature in PubMed, Embase, CINAHL Plus, and Scopus. We screened the retrieved abstracts for eligibility against inclusion criteria and conducted a full-text review of all eligible studies on de-implementation interventions in cancer care delivery. We used the framework analysis approach to summarize included studies' key characteristics including design; outcome(s); type of cancer, objective(s); and de-implementation interventions, determinants of the use ofthe use of de-implementation interventions, and their effectiveness. We assessed included studies' quality using the NIH Quality Assessment Tools.

Results

Out of 2,793 studies, 13 met our inclusion criteria. Included studies have been published between 2003 and 2020, and the majority (n = 9) of them were conducted in the USA. They covered several cancer types including prostate cancer (n = 4), multiple cancers (n = 3), hematologic cancers (n = 3), lung cancer (n = 1), breast cancer (n = 1), and gastrointestinal cancer (n = 1). Four studies were focused on de-implementing low-value diagnostic tests, six studies focused on de-implementing low-value treatment procedures, and three studies focused on low-value screening services. Most of the de-implementation interventions (n = 11) were effective in reducing low-value care. No study assessed the determinants of the use of de-implementation interventions.

Conclusions

This review showed that to accelerate the reduction of low-value cancer care, instead of solely relying on diffusion new evidence and guidelines (i.e., passive de-implementation), healthcare organizations should initiate de-implementation interventions and implement strategies purposefully aimed at reducing low-value care (i.e., active de-implementation). Additionally, future research should include a broader range of variables such as patients' perspectives and preferences, unintended effects of de-implementing low-value care, and system-level factors when studying de-implementation.

Contributions To The Literature

- We systematically reviewed the literature on the de-implementation of low-value services in cancer care delivery.
- Our findings highlight the need for moving from passive de-implementation (i.e., clinicians voluntarily follow the new guidelines and decide to change the way they practice) to active de-implementation (i.e., organizations initiating interventions aimed at reducing the low-value care).
- Future research on the de-implementation of low-value care in cancer care delivery should include a broader range of factors, such as patients' perspectives, organizational culture, leadership, and resources, and the unintended consequences of de-implementation efforts.

- Our findings underscore the need for developing theory-based frameworks that provide a practical guide for systematically assessing de-implementation interventions.

Background

The National Cancer Institute estimates that the cost of cancer-related medical services and prescription drugs will be over $246 billion by 2030 [1]. One method of controlling cancer care costs without reducing the quality of care is to de-implement low-value services. While there is no universally accepted definition of de-implementation, it is generally defined as reducing, replacing, or stopping (partially or completely) low-value services [2,3]. The National Academy of Medicine defines a low-value service as one where the potential risk of harm outweighs the potential benefits, wastes patients' time or money, and does not increase the value of care to the patient [4,5]. For example, Prostate-Specific Antigen (PSA) screening for average-risk men [6,7], lung cancer screening for asymptomatic patients [8], and axillary staging and post-lumpectomy radiotherapy in women older than 70 years of age with clinically node-negative, hormone receptor + breast cancer [9] are considered low-value services in cancer care delivery. Given that there are known low-value services in cancer care, this presents an important setting to systematically evaluate de-implementation efforts.

Medical societies have developed several guidelines and recommendations pertaining to low-value tests, treatments, and follow-up processes across the cancer care continuum [10–12]. However, recent reviews found that a considerable proportion of services that cancer patients receive could still be classified as low-value [13,14]. For example, both the American Society for Clinical Oncology and Choosing Wisely Canada [15,16] recommend not to use imaging in early-stage breast cancer; despite these recommendations, about one-third of early-stage breast cancer patients underwent at least one advanced imaging exam (e.g., bone scan, positron-emission tomography) for staging [17,18]. While studies were conducted to explore why so few low-value clinical practices are de-implemented [19,20], available studies have primarily focused on changes in clinicians' practice patterns over time in response to educational campaigns (e.g., Choosing Wisely [11]), guidelines (e.g., European Society of Medical Oncology guidelines), or dissemination of scientific publications. Therefore, we know little about interventions that are used to de-implement low-value care in cancer settings. Additionally, to our knowledge, there is no systematic review that explores the current landscape of de-implementation of low-value services in cancer care delivery. As a result, our understanding of current de-implementation interventions in cancer care delivery and determinants of effective de-implementation efforts in cancer care is limited. Understanding current de-implementation efforts in cancer care delivery is important because it helps to scale up the use of de-implementation interventions and accelerate the reduction of low-value cancer care.

To address these gaps, we conducted this systematic review to summarize the literature on interventions to de-implement low-value care in cancer care delivery, define an agenda for future research, and inform the literature about opportunities for additional work.

Methods

We conducted a systematic literature review. We reported the results of the review according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. (Appendix A). The study protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) (registration number: CRD42021252482).

Search strategy

The literature search strategy was developed by the first author (AA) along with a professional medical research librarian (RC). The search was intentionally broad to minimize the risk of overlooking potentially relevant studies. The search strategy was developed for the concepts of cancer care delivery, low-value care, and de-implementation of cancer-related programs. The search strategies were created using a combination of subject headings and keywords and were used to

search PubMed, Embase, CINAHL Plus, and Scopus from January 1, 1990, to March 4, 2021, when all searches were completed. We applied the Cochrane human studies filter to exclude animal studies and added a systematic review keyword and publication type filter to exclude systematic review articles. The complete strategy for each of the searches can be found in Appendix B.

Study inclusion and exclusion criteria

To be included in the review, we required articles to focus on a purposeful effort or intervention to de-implement low-value cancer care. De-implementation was defined as removing, replacing, reducing, and restricting a low-value service [21]. Cancer care delivery was defined as a focus on the diagnosis and treatment of cancer, supportive and survivorship care, and cancer prevention. Additionally, studies were required to be peer-reviewed and report results of an empirical study. The detailed list of inclusion and exclusion criteria can be found in Table 1.

Table 1
Study eligibility criteria.

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Population	● Hospitals/Clinics ● Inpatient units ● Outpatient general medical settings (*e.g.*, primary care, urgent care, private offices) ● Cancer centers ● Emergency departments ● Managed care organizations	● Health insurance ● Free standing EDs ● Nursing home
Intervention	● Interventions that purposefully developed to remove[1], replace [2], reduce [3], restrict[4], reverse, de-implement, de-adopt, disinvest, decrease in use, discontinue, abandon, reassess, obsolet, withdraw, contradict, refute, delist, substitute, exnovate, cease, or end an established low value practice	● Changes in clinicians' practice pattern over time in response to educational campaigns, guidelines, or dissemination of scientific publications without active effort to de-implement an established low value practice
Reasons	● Ineffective interventions[5] ● Contradicted interventions[6] ● Mixed interventions[7] ● Untested interventions[8] ● Other reasons	
Outcome	● De-implementation determinants ● De-implementation process ● De-implementation outcome (e.g., effectiveness, volume of procedures, cost saving, quality)	● Any outcomes not listed
Study design	● Randomized trials ● Quasi-experiment studies ● Cross-sectional ● Qualitative studies ● Case reports and case studies ● Interrupted time-series studies or repeated measures studies ● Prospective and retrospective observational studies (i.e., cohort studies, case control studies)	● Descriptive studies with no outcomes data ● Modeling studies that used simulated data ● Not a clinical study (e.g., editorial, nonsystematic review, letter to the editor) ● Prospective and retrospective observational studies ● Clinical guidelines ● Measurement or validation studies ● Self-described pilot studies without adequate power to assess impact of intervention on outcomes.

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Publication types	● Full publication in a peer-reviewed journal ● English-language publications ● 1990 to current date	● Non-English language ● Not a full publication in a peer-reviewed journal ● Letters, editorials, reviews, dissertations, meeting abstracts, protocols without results
1. Removing an intervention is the process of stopping the delivery of an inappropriate intervention entirely.		
2. Replacing an intervention involves stopping an inappropriate intervention and starting a new, evidence-based intervention that targets the same or similar proximal or distal patient-level health behaviors or health outcomes.		
3. Reducing an intervention involves changing the frequency and/or intensity with which that intervention is delivered.		
4. Restricting an intervention occurs when the scope of an intervention is narrowed by target population, health professional, and/or delivery setting.		
5. Ineffective interventions are those for which a few (if not many) high-quality studies have shown to not improve patients' health outcomes or behaviors and may actually incur more harm than benefit.		
6. Contradicted interventions (i.e., medical reversals) are those for which a newer, higher-quality study (or studies) indicates that the health intervention does not improve outcomes, which is contrast to a previous, lower-quality study (or studies) indicating that it does work.		
7. Mixed interventions are those for which the quantity and quality of evidence in support of and against the effectiveness of the intervention is approximately equal.		
8. Untested interventions are those for which little to no empirical evidence exists about their effectiveness because they have yet to be studied.		

Study selection process

Pairs of authors independently screened titles and abstracts against the eligibility criteria. Discrepancies were resolved through discussions between members of each pair and, when necessary, a third team member reviewed the discrepancy until a consensus was reached. To ensure inter-rater reliability of reviews, three iterations of sample reviews were conducted with each person reviewing 50 articles until an average agreement of 83.38% was reached. The full-text articles were screened in the same manner.

Data extraction and analysis

A framework analysis approach was used to summarize the evidence of de-implementation interventions aiming to reduce low-value cancer care [22]. The framework analysis approach included five stages (i.e., familiarization, framework selection, indexing, charting, and mapping and interpretation.) First, team members read included studies and familiarized themselves with the literature. Second, we identified conceptual frameworks that served as the codes for data abstraction [21,23,24]. To describe studies in which researchers have studied de-implementation strategies aiming to reduce low-value cancer care, we used a thematic framework that included publication year, design, outcome(s), type of cancer, unit of data collection, objective(s), country, setting, type/name of low-value care, de-implementation intervention description (e.g., type, name), single or multifaceted de-implementation intervention strategy, any framework/conceptual or theoretical model used, barriers to de-implementation intervention use, the effectiveness of the de-implementation intervention, and assessment of patients' priorities/perceptions when de-implementing the low-value care. Next, pairs of authors completed indexing and charting by placing selected text from included articles into the appropriate cells within our framework. Data from the included studies were extracted into a standardized data extraction form in Microsoft Excel (version 2016). Last,

we analyzed extracted data from each cell to describe the studies and findings of de-implementation strategies aiming to reduce low-value cancer care.

Two independent authors assessed the quality of these studies using three risk of bias tools (based on studies' methodology) including 1) NIH Quality Assessment Tool for the controlled intervention studies; 2) NIH Quality Assessment Tool for the before-after (pre-post) studies with no control group studies, and 3) NIH Quality Assessment Tool for the observational cohort and cross-sectional studies [25]. Disagreements in the risk of bias scoring were resolved by consensus or by discussion with a third author.

Results

The searches in PubMed, Embase, CINAHL, and Scopus yielded 5,290 citations. These citations were exported to Endnote (Version 20) and 2,504 duplicates were removed using the Endnote deduplication feature. Additionally, seven records were identified through hand searching. This resulted in a total of 2,793 unique citations found across all database searches. Titles and abstracts of the 2,793 articles were screened; 52 were selected for full-text screening. Of the 52 studies, 39 were excluded at full-text screening or during extraction attempts with the consensus of two coauthors; 13 unique eligible studies were included (Fig. 1).

Description of included studies

The included studies were published between 2003 and 2020 (Table 2). Most of the included studies (n = 9) were conducted in the USA. The remaining studies were conducted in France (n = 2), Netherlands (n = 1), and the UK (n = 1). The studies covered several cancer types including prostate cancer (n = 4), multiple cancers (n = 3), hematologic cancers (n = 3), lung cancer (n = 1), breast cancer (n = 1), and gastrointestinal cancer (n = 1). Four studies focused on de-implementing low-value diagnostic tests (e.g., ordering of three markers, imaging in patients with low-risk prostate cancer), six studies focused on de-implementing low-value treatment procedures (e.g., administering antibiotics during neutropenia, inappropriate use of peripheral intravenous and urinary catheters), and three studies focused on low-value screening services. The main objective of all included studies was to test the effectiveness of de-implementation interventions (e.g., examining the effectiveness of alternate formats for presenting benefits and harms information in reducing intentions for unnecessary prostate and colorectal cancer screening). Most included studies (n = 10) used either interrupted time series or pre-post study designs, two studies were randomized clinical trials, and one study was an observational cohort study.

Table 2
Characteristic of included studies.

Citation	Type of cancer	Study design	Country	Setting and participants	Study primary objective	Type/name of low value care
Durieux et al. (2003)	GI Tumors	Interrupted time series	France	An academic medical center	To evaluate the long-term impact of an intervention designed to reduce the ordering of three tumor markers frequently prescribed for gastroenterological diseases (carcinoembryonic antigen, alpha-fetoprotein, carbohydrate antigen 19 – 9).	Ordering of three tumor markers (carcinoembryonic antigen, alpha-fetoprotein, carbohydrate antigen 19 – 9)
Miller et al. (2011)	Prostate cancer	Before and after study	US	Urology practices	To describe findings from a Urological Surgery Quality Collaborative project focused on improving the use of radiographic staging in men with newly diagnosed prostate cancer.	Imaging in patients with low-risk prostate cancer.
Butler et al. (2015)	Hematologic cancers	Before and after study	UK	An academic medical center	To assess the impact of a clinical decision support system for blood product ordering in patients with hematologic disease.	Unnecessary blood transfusion
Ross et al. (2015)	Prostate cancer	Before and after study	US	Urology practices	To determine whether collaborative-wide data review and performance feedback would decrease the imaging rate in men with low-risk prostate cancer.	Imaging in patients with low-risk prostate cancer

Citation	Type of cancer	Study design	Country	Setting and participants	Study primary objective	Type/name of low value care
Shelton et al. (2015)	Prostate cancer	Interrupted time series	US	Outpatient clinics in the Veterans Affairs Greater Los Angeles, an urban academic VHA medical facility, and ambulatory care centers	To determine whether a highly specific computerized clinical decision support alert to remind providers, at the moment of PSA screening order entry, of the current guidelines and institutional policy would reduce the use of inappropriate PSA-based prostate cancer screening among men aged 75 and over.	PSA-based screening for prostate cancer in men aged 75 years and older
Goodman et al. (2016)	Lung cancer	Before and after study	US	A comprehensive cancer center	To examine the baseline rate of primary prophylactic pGCSF administration for patients with non–small-cell lung cancer, increase provider awareness of appropriate pGCSF use, and minimize the prescription of primary prophylactic pGCSF for patients with lung cancer who are treated with low- risk chemotherapy regimens, without a negative impact on patient safety.	Prophylactic pegylated granulocyte colony-stimulating factor use for patients with non–small-cell lung cancer who receive chemotherapy
Sheridan et al. (2016)	Prostate and Colorectal cancer	Randomized clinical trial	US	Community-based practices	To examine the comparative effectiveness of 4 alternate formats for presenting benefits and harms information in reducing intentions for screening and changing secondary behavioral and decision-making outcomes for patients eligible for 1 of 3 low-value or potentially low-value screening services.	Prostate cancer screening in men ages 50–69 years and colorectal cancer screening in men and women ages 76–85 years
Turner et	Prostate	Randomized	US	Primary care	To test whether	PSA-based

Citation	Type of cancer	Study design	Country	Setting and participants	Study primary objective	Type/name of low value care
al. (2016)	cancer	clinical trial		offices	counseling based on the family history (FH) and counseling based on a genetic risk score (GRS) plus FH would differentially affect subsequent PSA screening at 3 months (primary outcome), a randomized trial of FH versus GRS plus FH was conducted with 700 whites aged 40 to 49 years with- out prior PSA screening. Secondary outcomes included anxiety, recall, physician discussion at 3 months, and PSA screening at 3 years. Pictographs versus numeric presentations of genetic risk were also evaluated To test whether counseling based on the family history (FH) and counseling based on a genetic risk score (GRS) plus FH would differentially affect subsequent PSA screening at 3 months (primary outcome), a randomized trial of FH versus GRS plus FH was conducted with 700 whites aged 40 to 49 years with- out prior PSA screening. Secondary outcomes included anxiety, recall, physician	screening for prostate cancer in patients with low-risk prostate cancer

Citation	Type of cancer	Study design	Country	Setting and participants	Study primary objective	Type/name of low value care
					discussion at 3 months, and PSA screening at 3 years. Pictographs versus numeric presentations of genetic risk were also evaluated To test whether counseling based on the family history (FH) and counseling based on a genetic risk score plus FH would differentially affect subsequent PSA screening at 3 months. Among whites aged 40 to 49 years without prior PSA screening. Secondary outcomes included anxiety, recall, physician discussion at 3 months, and PSA screening at 3 years.	
Hill et al. (2018)	Breast cancer	Before and after study	US	A comprehensive interdisciplinary breast center	To measure compliance with guidelines for ordering complete blood cell count (CBC) and liver function tests (LFT) before and after the calendar date when the guidelines transitioned from routine to unnecessary.	Ordering complete blood cell count and liver function tests in patients with early breast cancer
La Matire et al. (2018)	Leukemia	Interrupted time series	France	An academic medical center	To evaluate the impact of an antimicrobial stewardship intervention on antibacterial consumption.	Administering antibiotics during neutropenia

Citation	Type of cancer	Study design	Country	Setting and participants	Study primary objective	Type/name of low value care
Bartash et al. (2020)	Hematologic cancers	Before and after study	US	An academic medical center	To evaluate whether 3 antimicrobial stewardship tool kit composed of local treatment guidelines, methicillin-resistant Staphylococcus aureus epidemiology, and antibiotic use ratios improve vancomycin prescribing for febrile neutropenia?	Inappropriate vancomycin for febrile neutropenia
Hoque et al. (2020)	Colorectal, breast and Non-small cell lung cancer	Observational cohort study	US	VA Medical Centers	Evaluate the influence of FDA black box warnings & Risk Evaluation Monitoring Strategies on use of Erythropoiesis stimulating agent in Veterans Administration cancer patients with chemotherapy induced anemia.	ESA treatment use and transfusion
Laan et al. (2020)	Multiple not specified	Interrupted time series	Holland	University and general hospitals	To reduce inappropriate use of catheters to reduce health care-associated infections.	Inappropriate use of peripheral intravenous and urinary catheters

De-implementation interventions' characteristics

De-implementation interventions' characteristics can be found in Table 3. From the four types of de-implementation action [21] (i.e., removing, replacing, reducing, and restricting), all the actions in included studies aimed at reducing low-value care. None of the included studies applied theories, models, and frameworks to identify the determinants of the use of the de-implementation interventions. Most of the implemented interventions (n = 9) were multi-faced (e.g., a multistep intervention including audit and performance feedback, having a clinical champion, and establishing the quality collaborative as an infrastructure for physician-led, collaborative quality improvement). Most of the de-implementation interventions (n = 11) were effective in reducing low-value care (e.g., an antimicrobial stewardship intervention significantly reduced the level of carbapenem consumption (level change = − 135.28 ± 59.49; p = 0.04)). Only two of the included studies reported the patients' priorities and perceptions while exploring the de-implementation of low-value care. Eight studies mentioned determinants of de-implementing low-value care (e.g., complying with patient preferences and clinicians' lack of confidence and trust in the new evidence, and bias inertia toward low-value care (i.e., status quo bias)). However, none of those studies assessed determinants of de-implementing low-value care, nor did they assess the determinants of the use of de-implementation interventions. Across all studies, six had little risk of bias, three had a moderate risk of bias, and four had a high risk of bias. Results are further summarized in Appendix C.

Table 3
Description and key features of interventions implemented to de-implement low-value care in cancer care delivery.

Citation	Description	Determinants	Effective	Single or multifaceted[2]	Theory, model, or framework[3]	Considering patients' perceptions
Durieux et al. (2003)	A specific laboratory order form with recommendations to improve appropriate orders	Poor scientific knowledge concerning utility of different markers	Yes	Single	No	No
Miller et al. (2011)	A multistep intervention including 1) audit and performance feedback 2) having a clinical champion 3) establishing the Urological Surgery Quality Collaborative as an infrastructure for physician led, collaborative quality improvement in urology.	1) Most clinicians have little or no empirical data regarding their own practice patterns, 2) even when such data are available, many urologists are uncertain about how to implement QI interventions.	Yes	Multifaceted	No	No
Butler et al (2015)	Computerized physician order entry systems have been integrated with a clinical decision support system software to improve compliance with restrictive blood management protocols. Such systems require physicians to specify the indication for blood product transfusion and highlight to the clinician the requests that lie outside prespecified guidelines for transfusion by linking them to the most recent laboratory results. In addition, extensive, real-time education, support and feedback were provided to clinicians.	The amount of time and manpower required to provide monitoring, analysis, and feedback. Provider reluctancy.	Yes	Multifaceted	No	No
Ross et al. (2015)	A multistep intervention including 1) audit and performance feedback 2) having a clinical champion.	NR	Yes	Multifaceted	No	No

1- Not reported

2- Cochrane Effective Practice and Organization of Care Group defined multifaceted interventions as any intervention including two or more components.

3- Using theory, model, or framework in developing the de-implementation intervention.

Citation	Description	Determinants	Effective	Single or multifaceted[2]	Theory, model, or framework[3]	Considering patients' perceptions
Shelton et al (2015)	A pop-up message to alert providers ordering a screening PSA test in a patient 75 years of age or older. When triggered, a brief interruptive educational message was shown on the ordering screen. The pop-up gave the provider the option of continuing with or canceling the order.	The complete rebound in monthly screening rates during off period, alert fatigue	Yes	Single	No	No
Goodman et al (2016)	Three plan-do-study-act cycles, educated providers about the appropriate use and cost of pGCSF, developed the Cleveland Clinic consensus guidelines, Removed primary prophylactic pGCSF from LRCR EMR orders.	Lack of knowledge, the details of guidelines published by oncology societies	Yes	Multifaceted	No	No
Sheridan et al. (2016)	One-page, written evidence-based decision support sheet.	NR	No	Single	Yes	Yes
Turner et al (2016)	Saliva samples from patients were tested. Genetic counselors followed prepared scripts when disclosing results of genetic tests. All unexpected questions were recorded. Each subject was given a copy of a Centers for Disease Control brochure on PCa screening and provided with a resource card for more information.	NR	No	Single	No	Yes

1- Not reported

2- Cochrane Effective Practice and Organization of Care Group defined multifaceted interventions as any intervention including two or more components.

3- Using theory, model, or framework in developing the de-implementation intervention.

Citation	Description	Determinants	Effective	Single or multifaceted[2]	Theory, model, or framework[3]	Considering patients' perceptions
Hill et al. (2018)	A planned implementation strategy using levels of the National Quality Strategy including 1) Learning and Technical Assistance, 2) Measurement and Feedback, 3) Certification, Accreditation, and Regulation, 4) Innovation and Diffusion (of quality improvement strategies), 5) Workforce Development, 6) Patient education, 7) Reward providers, and 8) Modify the existing electronic medical record synoptic documentation template	1) Integrated health care systems, 2) Resource availability (e.g., electronic medical records and funding for academic research assistants)	Yes	Multifaceted	Yes	No
La Matire et al. (2018)	1) Creation, collegial discussion, approval, and implementation of internal flow charts, 2) A daily re-evaluation of antibiotic prescription (molecule choice and dosing) according to diagnostic results, available guidelines, and experience, 3) Adding senior hematologists to supervise the process.	Lack of dedicated literature and clinicians' reluctance	Yes	Multifaceted	No	No
Bartash et al (2020)	A multistep intervention including 1) a quasi-experimental, pre-post educational intervention with audit for appropriateness of vancomycin initiation, 2) an examination of unit-wide antibiotic use ratios and, 3) an evaluation of the role of MRSA colonization screening in predicting invasive MRSA infection.	NR	Yes	Multifaceted (Three steps were conducted at different time periods)	No	No
Hoque et al. (2020)	FDA black box warnings & Risk Evaluation Monitoring Strategies	National Policies and Regulatory Decisions, Patient Consent	Yes	Multifaceted	No	No

1- Not reported

2- Cochrane Effective Practice and Organization of Care Group defined multifaceted interventions as any intervention including two or more components.

3- Using theory, model, or framework in developing the de-implementation intervention.

Citation	Description	Determinants	Effective	Single or multifaceted[2]	Theory, model, or framework[3]	Considering patients' perceptions
Laan et al. (2020)	1) Nurse education, 2) physician champion, 3) empowerment of nurses depending on the local situation of the participating hospital, 4) audit and feedback.	NR[1]	Yes	Multifaceted	No	No
1- Not reported						
2- Cochrane Effective Practice and Organization of Care Group defined multifaceted interventions as any intervention including two or more components.						
3- Using theory, model, or framework in developing the de-implementation intervention.						

Discussion

This systematic review aimed to summarize existing de-implementation efforts in cancer care delivery, including what types of interventions exist, their effectiveness, and factors that may affect the use of the de-implementation intervention. Overall, our review found that very few planned interventions have been used to de-implement low-value cancer care. This is surprising given how many services have been identified as low-value in cancer care. The lack of de-implementation interventions to reduce low-value care may explain why low-value cancer care persists, despite significant forces over the past decade to reduce low-value care [13,14]. While educational campaigns and medical guidelines have shown some potential in raising awareness regarding low-value services in cancer care [26], recent studies demonstrate that, in many areas, those recommendations had a limited effect on reducing low-value care [27,28]. Similar to implementing a novel intervention or policy, de-implementation of a low-value practice is a complex process that is influenced by multi-level factors, and lack of knowledge is rarely the only barrier [21,29,30]. Therefore, simply diffusing evidence without active efforts to abandon a particular low-value practice is unlikely to lead to meaningful results. This finding highlights the need for moving from passive de-implementation (i.e., solely relying on disseminating evidence and expecting that clinicians will voluntarily follow new guidelines) to active de-implementation (i.e., implementing interventions and strategies purposefully aimed at reducing low-value care, such as workflow modification and systems facilitating change).

Our review also revealed a paucity of evidence in five other key areas. First, the focus of all the included studies was to test the effectiveness of de-implementation interventions. Future studies should focus on other aspects of de-implementation interventions such as exploring the de-implementation intervention development process (e.g., resource requirements), the relationship between de-implementation interventions and health disparity, and the de-implementation intervention adaptations process [21]. Similarly, research is needed to explore the relationship between different categories of low-value cancer care (e.g., screening, testing, treatment) and de-implementation intervention effectiveness. This is important because patients' attitudes toward different parts of the cancer care continuum are variable. For example, while patients are generally in favor of taking fewer medications, they also believe that more testing and screening lead to better outcomes [31].

Second, a very limited number of the included studies explored the association between de-implementation interventions and patients' perspectives and preferences. Patients' perspectives and preferences are key determinants of many practices in cancer care, and poor understanding of the patient perspective and failure to include patients' preferences in efforts to de-implement low-value care may jeopardize the de-implementation process [34]. This is important because prior research shows that most patients overestimate the benefits and underestimate the harms of medical services [31–33]. Furthermore, not all populations react to de-implementation efforts in the same way [35]. For example, while prior research

showed Black and Hispanic Americans are at higher risk of both overuse of low-value care and underuse of high-value care [36], they have been found to perceive de-implementation efforts as withholding potentially beneficial care [37]. Therefore, in assessing the de-implementation of low-value care, future research should consider patients' perceptions of appropriate use and overuse of health services in oncology and de-implementing low-value services.

Third, none of the included studies used theories, models, or frameworks to identify the determinants of using de-implementation interventions. This may relate to the lack of a consolidated theoretical framework that provides a practical guide for systematically assessing the determinants of the use of de-implementation interventions [34]. While implementation and de-implementation determinants of interventions have many similarities (e.g., stakeholder engagement, leadership buy-in), some determinants may be unique to de-implementation. For example, Helfrich et al. highlight that de-implementation may require a process of unlearning to change knowledge, intentions, and beliefs about a low-value service [38]. Additionally, de-implementation efforts may be supported by replacement. We found that the majority of studies in this review focused on reducing low-value services; however, providing clinicians with an evidence-based intervention (i.e., high-value intervention) that could serve as a substitute for the low-value service may be an effective strategy for promoting de-implementation that warrants further testing [38]. This highlights the need for developing and disseminating frameworks particularly aimed at identifying de-implementation determinants.

Fourth, many individual-level (patient- and provider-level) factors related to de-implementation strategies were mentioned in included studies, such as the provider-patient relationship, defensive medicine [30], and uncertainty and negative perceptions toward new guidelines [39]. However, none of the included studies measured the collective-level factors (e.g., community, organizational characteristics, and reimbursement policies) that were associated with the de-implementation of low-value care. This is an important gap because, in addition to individual-level factors, many collective-level factors (e.g., organizational culture, leadership, resources, and financial status) contribute to the utilization of low-value care [40,41]. In many cases, healthcare organizations intentionally decide to continue providing low-value care. For example, some hospitals, particularly those with financial difficulties, may resist de-implementing low-value practices (e.g., novel experimental technologies) if those services generate significant revenue or provide another relative advantage (e.g., competitive edge) over other hospitals [21,27,29]. Therefore, understanding collective-level factors that affect the de-implementation of low-value care is a research priority.

Fifth, de-implementation interventions may have unexpected and unintended effects on patient and clinician experiences. Despite this, none of the included studies measured the unintended consequences of the de-implementation interventions. This is an important gap because de-implementation interventions may have unintended consequences that affect patients, such as increased distrust of the health care system, questioning of underlying motives of de-implementation (e.g., patients may perceive de-implementation interventions as cost-cutting efforts), and undermining patient autonomy [31,33,42]. It is therefore imperative that the future evaluations of de-implementation interventions consider broader measures to assess the de-implementation interventions' effects, both positive and negative.

This review has some limitations. Because of the heterogeneity of populations, interventions, and outcomes, we were unable to conduct a meta-analysis. Also, we limited our systematic reviews to English-only articles which could result in biased estimates of effect and reduce generalizability. Finally, because of challenges in identifying low-value health care [43], it is possible that some organizations de-implemented interventions without labeling them as low-value care. Therefore, despite a comprehensive literature search, there remains a possibility that we may have missed relevant studies. Additionally, all the included studies were conducted in the US or European countries; therefore, the findings may not be generalizable to other regions.

Conclusion

This review demonstrated a paucity of evidence in many key areas of the de-implementation of low-value care in cancer care delivery. First, the assumption that new evidence, guidelines, and reimbursement policies alone will change the way clinicians practice is likely misplaced. Relying on clinicians to change their practice in the absence of well-designed de-implementation interventions is unlikely to reduce low-value care. To accelerate the reduction of low-value care in cancer care delivery, healthcare organizations should initiate interventions developed based on evidence of determinants of the de-implementation of low-value care. Second, future research should include a broader range of variables when studying de-implementation. Factors such as patients' perspectives and preferences; patient satisfaction; and system-level factors such as organizational culture, leadership, and resources are understudied yet likely relevant de-implementation determinants. Similarly, future studies should assess unintended effects of de-implementing low-value care, such as increased distrust of the health care system, and undermining patient autonomy. Finally, we recognize a need for theoretical frameworks that provide practical guidance for systematically assessing de-implementing determinants of low-value care.

Abbreviations

NIH National Institutes of Health

PRISMA Preferred Reporting Items for Systematic Reviews and Meta-analyses

Declarations

Ethics approval and consent to participate

Not applicable. Registered in PROSPERO (registration number: CRD42021252482).

Consent for publication

Our manuscript does not contain any identifiable data in any form, either at the organizational level or individual level.

Availability of data and material

The data used and/or analyzed during the current study are available from the corresponding author on reasonable request and subject to IRB guidelines.

Competing Interests

The authors declare that they have no competing interests.

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None.

Author contributions

All authors made significant contributions to the manuscript. AAT and SB conceived and designed the study; AAT and RC developed and tested the search strategy; RC deployed the search strategy; KT, AC, YH, GW, and ON reviewed all identified publications, identified those that met the inclusion criteria, as well as extracted and analyzed content from the relevant publications. RC and AAT supervised the conduct of the study and data collection. AAT, SB, KT,
AC, YH completed the search and reviewed the final manuscript file. AAT, KT, AC, YH, GW, and ON performed risk of bias and reviewed the final manuscript. AAT drafted the manuscript, and all authors contributed substantially to its revision. KT,

AC, YH, and SB provided critical revisions to the manuscript for important intellectual content. All authors read and approved the final manuscript. AAT takes responsibility for the paper as a whole.

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Figures

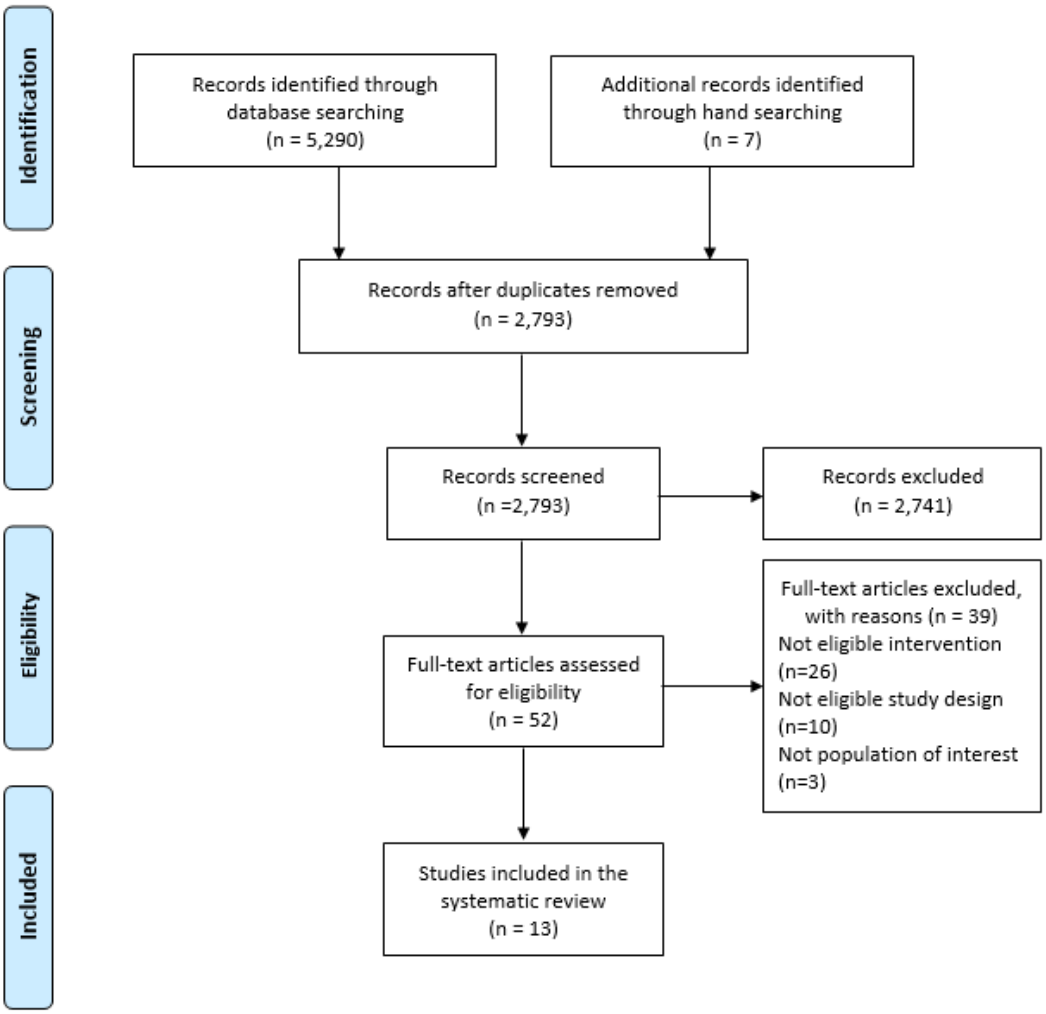

Figure 1

PRISMA Literature Flow Diagram.

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