


Understanding Healthcare Personnel's Perceptions About Reducing Low-Value Care: A Scoping Review

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Objective: To systematically and comprehensively search the studies describing healthcare personnel's perceptions about reducing low-value care.

Design: Scoping review.

Methods: Evidence sources included PubMed, ProQuest and CINAHL databases from inception to 13th September 2023, along with grey literature, expert suggestions and reference lists from the included articles. Studies were included if they contained information about healthcare personnel's perceptions and involvement in reducing low-value care. The extracted data included general study characteristics, the type of low-value care of interest, clinical settings, and main findings related to healthcare personnel's perceptions. Three frameworks were used to guide the data synthesis. First, the main findings from the included studies were mapped onto the Process of De-adoption Framework to capture the aspects of low-value care that healthcare personnel focused on, including the identification of low-value care, barriers and facilitators to reducing low-value care, and intervention strategies. The identified barriers and facilitators were then mapped onto the relevant domains of the *Theoretical Domains Framework*. Finally, the intervention strategies, as informed by healthcare personnel's perceptions, were mapped to the *Cochrane Effective Practice and Organization of Care taxonomy framework*.

Results: The 37 included studies were those published since 2011. Of these, 15 studies were conducted in the United States. Most included studies (n = 19) described low-value care not specific to a care measure. Twelve of the included studies described healthcare personnel's perceptions regarding the identification of low-value care, 34 studies described healthcare personnel's perceptions regarding influence factors to reducing low-value care and 18 studies described healthcare personnel's perceptions regarding intervention strategies to reduce low-value care. "Knowledge" (n = 16) and 'environmental context and resources' (n = 16) were the most common influence factors of reducing low-value care. "Education" was the most commonly discussed intervention strategy for reducing low-value care (n = 14).

Conclusion: Healthcare personnel's perceptions focused on identifying low-value care, barriers and facilitators of reducing low-value care and intervention strategies to reduce low-value care. Education was potentially the main effect of the intervention strategies in addressing lack of knowledge, which is the main barrier to reducing low-value care. Future research should develop and implement intervention strategies to reduce low-value care based on healthcare personnel's perceptions.

Keywords: low-value care, reducing, de-implementation, evidence-based practice

Introduction

Low-value care generally refers to healthcare measures that do not have evidential support, involve dangers that are greater than their advantages, are not cost-effective or do not conform to the patient's values and preferences.^{1,2} Low-value care is widespread in clinical practice and includes examples such as the misuse of medications, routine dressing changes, and unnecessary vitamin testing. A previous study reported that almost a third of patients receive healthcare

services that evidence suggests are unneeded, inefficient or potentially hazardous.³ Over 500 low-value care lists have been released by the Choosing Wisely campaign.⁴ Similarly, the Do-not-do database was produced by the National Institute for Health and Care Excellence.⁵ Studies from Australia, the United States (USA) and the Netherlands identified 156, 146 and 1,366 low-value practices, respectively.^{6–8} Low-value care takes up healthcare personnel's time, hinders the delivery of high-value care, causes physical and psychological harm to patients and increases the economic burden on the healthcare system.^{9,10} Low-value care is estimated to cost between \$760 billion and \$935 billion in nations such as the USA, approximately 25% of overall healthcare spending.¹¹

Therefore, it is important to reduce the prevalence of low-value care. However, an obvious decline in the use of low-value care has not been observed because reducing low-value care is difficult.¹² The difficulties involved in frequently changing long-standing routines can be made more difficult by normal routine, egos and inertia. In addition, reductions in low-value care are influenced by healthcare personnel, patients, family caregivers, and policymakers.^{13,14} A previous review of studies on reducing low-value care primarily focused on understanding patients' perceptions.¹³ In contrast to patients, healthcare personnel are the initiators and executors of care measures, and understanding their perspectives is essential for identifying low-value care and the barriers and facilitators that influence the reduction of low-value care, as well as developing effective intervention strategies to reduce low-value care.¹⁴ To date, no reviews have combined findings on the perceptions of healthcare personnel regarding reducing low-value care. Therefore, the objective of this study was to gain a comprehensive understanding of healthcare personnel's perceptions regarding the reduction of low-value care. Specifically, this study aimed to describe healthcare personnel's perceptions on identifying low-value care, the influence factors about reducing low-value care, and effect intervention strategies to reduce low-value care. This healthcare personnel perspective will provide a useful alternative in explaining the low value care in the health care system. In the current study, scoping review methods were used to comprehensively research the study to better know the current perspectives of healthcare personnel for decreasing low-value care. We chose a scoping review approach because it offers the best option for combining and mapping data from a number of studies, which is anticipated to be substantial and diverse.

Methods

Overview and Definitions

We developed the methods under the Joanna Briggs Institute Methodology for Scoping Reviews' guidance.¹⁵ The protocol of this scoping review was registered in the Open Science Framework. The reporting in this scoping review was governed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist.¹⁶

Considering the concept analysis, the operational definition of "low-value care" was developed to refer to treatments, medical tests or nursing interventions that satisfy any of the listed criteria: that is, they are ineffective, almost ineffective, risks exceed benefits, are not cost-effective or do not conform to the values and preferences of patients.^{2,17} This is a broad definition that incorporates four aspects that are typically employed when considering the value of care (efficacy, safety, cost, and values and preferences).

Data Sources and Searches

PubMed, ProQuest and CINAHL electronic databases were searched. The search strategies ([Supplementary File 1](#)) were developed with the help of an experienced senior librarian. And then another librarian critically evaluated those search strategies using the Peer Review of Electronic Search Strategies criteria.¹⁸ Search terms included medical subject headings (MeSH), keywords and synonyms pertinent to three core themes: healthcare personnel, perceptions and low-value care. Because terminology can be complicated, the most frequently used terms in current scientific research were used to identify the low-value care literature (eg, de-adoption, de-implement, inappropriate, unnecessary and overuse).¹⁹ These purposefully broad search phrases reflect the lack of a taxonomy of terms used to describe low-value care acceptable to all parties. This scoping review focused on articles published from inception to 13th September 2023. The initial search was conducted on 5th February 2023, with an update performed on 13th September 2023. We also scanned

the grey literature to ensure the comprehensiveness of the reviewed studies, including Open Grey, Mednar and Choosing Wisely. The reference lists from the included studies were searched for additional studies, and subject matter specialists were consulted.

Citation Selection and Screening

Studies were included if they referred to the healthcare personnel's perceptions related to reducing low-value care and were published in English. Because this is a scoping review, we aimed to grasp the complete breadth of research on healthcare personnel's perceptions of reducing low-value care. Therefore, there was no limitation based on study design. All study types, including quantitative and qualitative research, were included. Studies that lacked full text were excluded.

All search results were imported into Endnote (version X9). After removing duplicates, two reviewers (A, B) independently reviewed the eligible studies in two phases using Endnote. Each reference was subjected to first screening, during which two reviewers screened the citation's title and abstract to decide if it qualified to acquire and review full text. Studies that satisfied the eligibility requirements or were ambiguous (partially satisfied them) continued to level two screening, where both researchers examined each citation's complete text to assess eligibility. If the citation was rejected, the specific justification was noted. Studies without abstracts were subjected to title/abstract screening to determine their eligibility. If the title seemed pertinent, the study moved on to full text review. Discrepancies in these processes were clarified through conversation or consultation with the third researcher (C). A similar screening process was performed on the reference lists of the included studies, first by title and abstract, and then by the entire text separately.

Data Extraction and Synthesis

Two reviewers (A, B) independently extracted data from all included studies using a self-designed form that had been validated using a randomly selected five studies. The reviewers moved on to comprehensive data extraction once data had been reliably abstracted ($\kappa=0.8$).²⁰ The extracted information mainly included study general information (ie author, year, country, sample and design), the low-value care involved (eg medication overuse, unnecessary tests), the clinical setting (eg hospital, primary care, community care, nursing homes) and the main finding related to healthcare personnel's perceptions. Considering the purpose of this study, only the data related to perceptions were extracted when the article contents contained perceptions and behaviour. In addition, only healthcare personnel's perceptions were extracted when the article contents contained perceptions from healthcare personnel and others.

Process of De-adoption Framework,²¹ Theoretical Domains Framework (TDF)²² and the Cochrane Effective Practice and Organization of Care (EPOC) taxonomy²³ (Table 1) were used to guide the data synthesis of healthcare personnel's perceptions. First, we mapped the main findings of the included studies onto the Process of De-adoption Framework²¹ to capture the content of low-value care on which the healthcare personnel were focused (eg identifying low-value care, identifying barriers and facilitators of reducing low-value care and identifying intervention strategies to reduce low-value care). The identified barriers and facilitators were then mapped into the relevant TDF domains (eg knowledge, skills, environmental context and resources).²² Finally, the identified intervention strategies to reduce low-value care based on the healthcare personnel's perceptions were mapped into the EPOC taxonomy framework (eg education, organisational culture, and length of consultation).²³

Included studies did not perform quality assessment because it was believed that given that this was a scoping review in which a high number of diverse studies were expected and wanted, it was unlikely to generate the type of relevant information that it would for a more focused systematic review.

Patient and Public Involvement

It was not appropriate to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our review.

Table 1 Conceptual Frameworks for Data Synthesis

Process of De-Adoption Framework ^{21*}	TDF ²²	EPOC ²³
Identify low-value care (Operational definition: The healthcare personnel know specific low-value care in their clinical practice or Choosing Wisely recommendations; The healthcare personnel's involvement in identifying or prioritise low-value care)	—	—
Identify barriers and facilitators in reducing low-value care (Operational definition: The healthcare personnel's perception of barriers and facilitators during reducing low-value care)	Knowledge; Skills; Social/Professional Role and Identity; Beliefs about Capabilities; Optimism; Beliefs about Consequences; Reinforcement; Intentions; Goals; Memory, Attention and Decision Processes; Environmental Context and Resources; Social influences; Emotion; Behavioural Regulation;	—
Identify intervention strategies to reduce low-value care (Operational definition: The healthcare personnel's perception of useful intervention strategies to reduce low-value care)	—	Implementation strategies (eg organisational culture; education; clinical practice guidelines; patient-mediated interventions); Governance arrangements (eg policy decisions); Financial arrangements (eg prepaid funding); Delivery arrangements (eg length of consultation; health information systems)

Notes: Adapted from Niven DJ, Mrklas KJ, Holodinsky JK, Straus SE, Hemmelgarn BR, Jeffs LP, Stelfox HT. Towards understanding the de-adoption of low-value clinical practices: a scoping review. *BMC Med.* 2015 Oct 6;13:255. © Niven et al 2015. Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>).²¹

Results

Citation Selection

The searches identified 11,042 studies in the electronic sources and grey literature (Figure 1). A total of 8,409 studies without replacement were reviewed after duplicates were eliminated; of these, 99 studies moved on to full text review for inclusion and 31 studies were included. The lack of attention paid to low-value care and healthcare personnel's perceptions were the most frequent justifications for removing studies at the phase of full-text review. Six new studies were identified during the screening of reference lists for included studies and contact with subject matter specialists, and included in the final review, which resulted in a total of 37 included studies.^{24–60}

General Characteristics of the Included Studies

The detailed information of the included literature is shown in Table 2. The 37 included studies were published from 2011 to 2022. Of the included studies, the largest number were conducted in the USA (n = 15), followed by Spain (n = 5) and Israel (n = 5). The included studies covered a variety of research designs with quantitative (n = 23), qualitative (n = 13) and mixed (n = 1) research methodologies. Most studies (n = 19) focused on a general sense of low-value care, with eight focusing on low-value tests and five on misused medications. The location of included studies was mainly within the inpatient hospital (n = 15) and primary care (n = 8) settings. Most of the included studies focused on described physicians' (n = 13) or nurses' (n = 13) perceptions about reducing low-value care. Two studies exclusively focused on the perspectives of clinical leaders and one study examined pharmacists' perspectives. The remaining eight studies described the perspectives about low-value care from several healthcare personnel, including physicians, anaesthetists and nurses.

Healthcare Personnel's Perceptions Regarding Reducing Low-Value Care

Figure 2 provides an overview of healthcare personnel's perceptions regarding the reduction of low-value care based on the included studies. Table 3 shows healthcare personnel's perceptions regarding reducing low-value care of the included studies

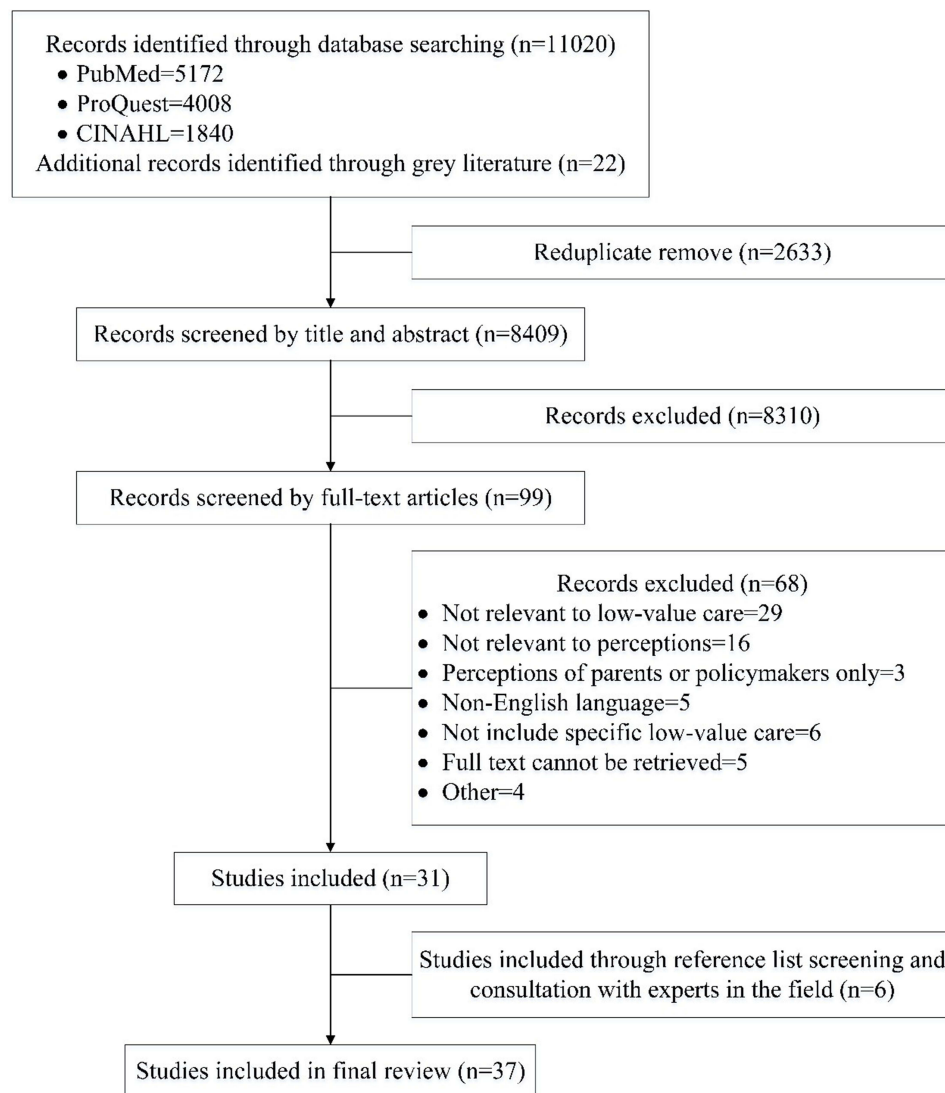


Figure 1 Study selection flow diagram.

in detail. According to the Process of De-adoption Framework, 12 of the included studies described healthcare personnel's perceptions regarding identifying low-value care, 34 studies described healthcare personnel's perceptions regarding the barriers and facilitators of reducing low-value care, and 18 studies described healthcare personnel's perceptions regarding intervention strategies to reduce low-value care. After mapping the identified barriers and facilitators to the TDF, "knowledge" was the most common determinant of reducing low-value care ($n = 17$), followed by "environmental context and resources" ($n = 16$) and "social influences" ($n = 15$). After intervention strategies to reduce low-value care were classified by EPOC taxonomy, the most commonly discussed intervention strategies to reduce low-value care were "education" ($n = 14$), followed by "length of consultation" ($n = 4$) and "organisational culture" ($n = 3$).

Discussion

This scoping review provides a comprehensive synthesis of healthcare personnel's perspectives on the reduction of low-value care. Over the past 10 years, the necessity and significance of reducing low-value care in the healthcare system has received increasing support from healthcare personnel and policymakers.⁶¹ However, reducing low-value care is difficult and complicated. Previous studies in the USA, Spain, Israel, and other countries, both quantitative and qualitative, have investigated this issue.^{24–60} Thirty-seven studies^{24–60} were identified in the current review, most of which were published

Table 2 Characteristics of the Included Studies in the Review (n = 37)

Author (Year)	Country	Study Design	Low-Value Care	Clinical Setting	Sample
Carlson KA (2022) ²⁴	USA	Descriptive questionnaire survey	Medications misused	Psychiatric hospital	123 nurses
Nusbaum L (2022) ²⁵	Israel	Descriptive questionnaire survey	Opioid pain medication misuse	Community and acute care settings	414 nurses
Perez D (2021) ²⁶	Australia	Qualitative study using semi-structured interview	Physical restraints during mechanical ventilation	Intensive care units	12 nurses
Ellen ME (2021) ²⁷	Israel	Qualitative study using semi-structured interview	Unnecessary use of oncology services	Oncology departments	20 nurses
Ellen M (2021) ²⁸	Israel	Qualitative study using semi-structured interview	Overuse of health services within oncology	Hospital-based oncology care setting	215 physicians
Bonfill X (2020) ²⁹	Spain	Descriptive questionnaire survey	531 Choosing Wisely lists	Hospitals and primary care centres	413 clinical leaders
Kool RB (2020) ³⁰	Netherlands	Descriptive questionnaire survey	Low-value care in primary care	Primary care	182 general practitioners
Mobrad AM (2020) ³¹	Saudi Arabia	Descriptive questionnaire survey	Drug abuse and misuse	Community care	239 pharmacists
Aranaz Andrés JM (2020) ³²	Spain	Descriptive questionnaire survey	Low-value surgical practices	A hospital	370 surgeons and anaesthetists
Rietbergen T (2020) ³³	Netherlands	Descriptive questionnaire survey	Routine MRI and arthroscopy use in degenerative knee disease	Orthopaedic care	413 orthopaedic surgeons
Osorio D (2020) ³⁴	Spain	Mixed methodology	134 Choosing Wisely lists	A tertiary hospital	169 doctors
Osorio D (2019) ³⁵	Spain	Descriptive questionnaire survey	38 Choosing Wisely lists	Outpatient, critical, surgical, emergency, inpatient, trauma, pregnancy units	265 nurses
Wiencek CA (2019) ³⁶	USA	National descriptive questionnaire survey	5 Choosing Wisely lists	Acute and critical care	1651 nurses

Blackburn J (2019) ³⁷	UK	Qualitative study using semi-structured interview	Remove dressings regularly	Acute and community settings	12 tissue viability nurses
Kua CH (2019) ³⁸	Singapore	Qualitative study using semi-structured interview	Inappropriate or unnecessary medications deprescribing	Nursing homes	Four doctors, four pharmacists, nine nurses
Bourgault AM (2019) ³⁹	USA	Qualitative study using semi-structured interview	Potentially harmful, ineffective or non-cost-effective tradition-based practice	An acute care hospital	22 nurses
Hofstede H (2019) ⁴⁰	Netherlands	Qualitative study using semi-structured interview	Unnecessary vitamin testing	Primary care	20 general practitioners
Ellen ME (2018) ^{a41}	Israel	Descriptive questionnaire survey	Overuse of health services	Community and hospital care	114 nurses
Ellen ME (2018) ^{b42}	Israel	Qualitative study using semi-structured interview	Overuse of health services	Community care	22 nurses
Mira JJ (2018) ⁴³	Spain	Descriptive questionnaire survey	Unnecessary tests and procedures	Primary care	936 general practitioners, 682 paediatricians, 286 nurses
Patey AM (2017) ⁴⁴	Canada	Qualitative study using semi-structured interview	Continuous foetal monitoring for healthy women	Birth units	12 nurses
Bishop TF (2017) ⁴⁵	USA	Qualitative study using semi-structured interview	Overuse of low-value service	General internal medical, emergency medicine, cardiology (non-interventional) and hospital medicine	31 academic physicians
Roman BR (2017) ⁴⁶	USA	Descriptive questionnaire survey	Overuse of inpatient laboratory testing	A cancer centre	837 doctors and nurses
Zikmund-Fisher BJ (2017) ⁴⁷	USA	National descriptive questionnaire survey	12 Choosing Wisely lists	Primary care	1776 physicians

(Continued)

Table 2 (Continued).

Author (Year)	Country	Study Design	Low-Value Care	Clinical Setting	Sample
Colla CH (2016) ⁴⁸	USA	Descriptive questionnaire survey	Health service overuse and Choosing Wisely campaign	Ambulatory care	584 physicians
Grover M (2016) ⁴⁹	USA	Descriptive questionnaire survey	Low-value clinical services	Primary care	143 physicians
Buist DS (2016) ⁵⁰	USA	Descriptive questionnaire survey	Unnecessary care or care that does not improve patient outcomes and can harm patients	Primary care	189 clinicians
Palagyi A (2016) ⁵¹	Australia	Qualitative study using semi-structured interview	Inappropriate medication in the older population	Long-term care facilities	27 general practitioners, pharmacists and nurses
Sears ED (2016) ⁵²	USA	National descriptive questionnaire survey	Inappropriate Imaging for low back pain	Department of Veterans Affairs	379 physicians, 130 nurse and 36 physician assistants
Miller J (2015) ⁵³	USA	National descriptive questionnaire survey	12 items of low-value care	Hospital, home healthcare/community health and long-term/subacute care	2356 nurses
Maughan BC (2015) ⁵⁴	USA	Descriptive questionnaire survey	Choosing Wisely campaign	Emergency departments	105 leaders
Muir-Cochrane EC (2015) ⁵⁵	Australia	Qualitative study	Restraint and seclusion use in short-stay acute old age psychiatry inpatient	Old age psychiatry inpatient units	39 nurses
PerryUndem Research (2014) ⁵⁶	USA	National descriptive questionnaire survey	Unnecessary tests and procedures	Primary and hospital care	600 physicians
He AJ (2014) ⁵⁷	China	Descriptive questionnaire survey	Overprescribing diagnostic tests, procedures and drugs	Public hospitals	504 physicians
Han PK (2013) ⁵⁸	USA	National descriptive questionnaire survey	Overuse of surveillance testing for breast cancer survivors	Primary and cancer care	1072 physicians and 1130 oncologists
Patey AM (2012) ⁵⁹	Canada	Qualitative study using semi-structured interview	Unnecessary preoperative testing in low-risk patients	Preoperative care	11 anaesthesiologists and five surgeons
Sirovich BE (2011) ⁶⁰	USA	National descriptive questionnaire survey	Unnecessary medical care	Primary care	627 physicians

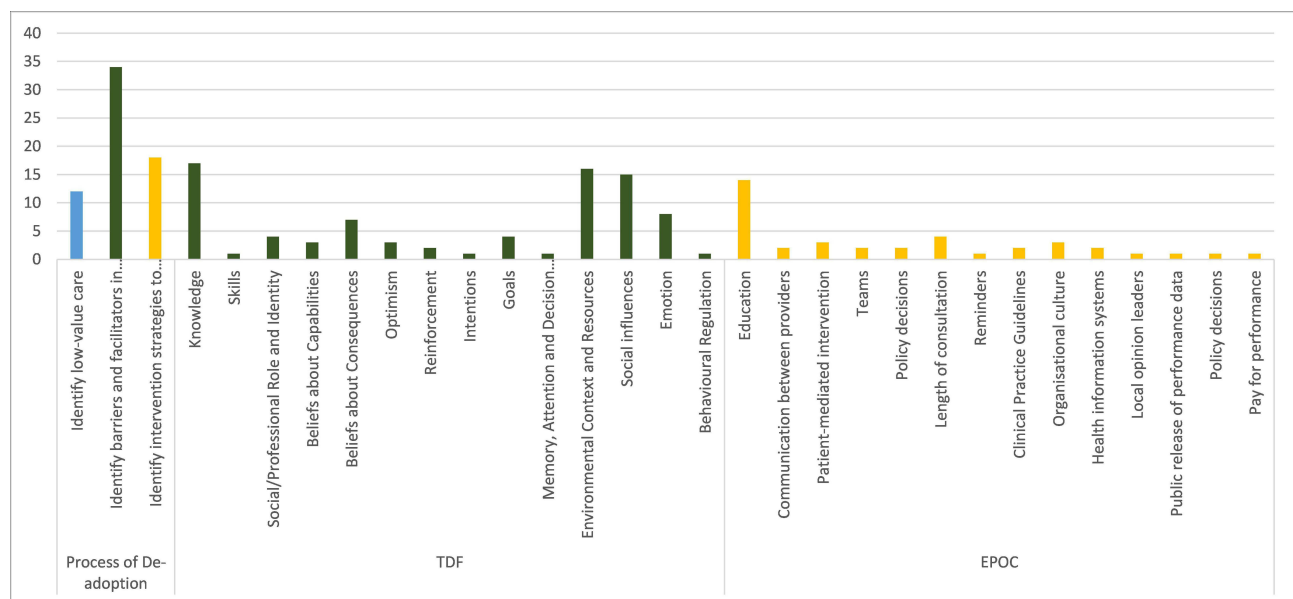


Figure 2 Classification of included studies according to the conceptual framework.

within the last 10 years. Among the host countries, the largest number of studies were conducted in the USA. This pattern may be related to the American Board of Internal Medicine's Choosing Wisely campaign, which was launched 10 years ago⁶² and has been supported by other countries.⁶³ Hence, the number of relevant studies of healthcare personnel's perceptions regarding low-value care has grown over time.

The current review indicates that healthcare personnel's perceptions regarding low-value care have focused on identifying low-value care, barriers and facilitators for reducing low-value care and intervention strategies to reduce low-value care. This review revealed that most studies focused on identifying influence factors for reducing low-value care. The current review revealed that "knowledge" and "environmental context and resources" were the most common barriers to reducing low-value care according to healthcare personnel's perceptions. A similar finding was reported in a previous study,⁶⁴ which aimed to assess the determinants of reducing low-value care. The knowledge domain can be explained by the fact that healthcare personnel lack the knowledge needed to identify low-value care and know the risk of low-value care. Although some countries have recognised the harm of low-value care since the Choosing Wisely campaign launched, awareness of low-value care among healthcare personnel is still insufficient. Thus, research on low-value care is still in its early stages and should be further advanced in the future. Additionally, although some low-value care practices are included in the Choosing Wisely lists, there is a lack of relevant measurement tools to assist healthcare personnel in accurately identifying low-value care. Future research on low-value care should adopt a multi-perspective approach to address these gaps. In our review, environmental context and resources are also common barriers to reducing low-value care. The environmental context of defensive medicine has been described as a driver of implementing low-value care and was noted by healthcare personnel as influencing their behaviour in the studies included in our review. A lack of time in consultation with patients is also an important issue regarding environmental context and resources in our review. In our review, perceptions of barriers to reducing low-value care varied between different types of healthcare personnel. Nurses were more likely than doctors to identify "social/professional role and identity" as a key barrier (see [Tables 2 and 3](#)). This may be attributed to the relatively lower professional boundaries that nurses face compared to doctors, leading nurses to experience greater challenges in the process of reducing low-value care. In contrast, doctors were more likely to cite "social influences" as a barrier (see [Tables 2 and 3](#)). This could be due to the greater external pressures that doctors face, such as patient expectations and group norms, which sometimes necessitate defensive or overuse practices. Consequently, doctors may perceive poor "social influences" as a more significant barrier to reducing low-value care.

Table 3 Healthcare Personnel's Perceptions in Low-Value Care (n = 37)

Author (Year)	Process of De-Adoption	TDF (Barriers and Facilitators)	EPOC (Intervention)	Details of Main Findings
Carlson KA (2022) ²⁴	Identify barriers and facilitators; Identify intervention strategies	Knowledge	Education	(1) Barrier and Facilitator: 33% of the respondents felt satisfied with their knowledge of the risks of misuse. (2) Intervention: Nurses expressed need for more education on the topic.
Nusbaum L (2022) ²⁵	Identify barriers and facilitators	Social/Professional Role & Identity; Knowledge; Environmental Context and Resources; Beliefs about Capabilities	—	(1) Barrier and Facilitator: The majority (60%) of the sample perceived their role positively; Nurses reported low scores on knowledge, perceived institutional support and self-efficacy relating to the issues surrounding opioid pain medication misuse.
Perez D (2021) ²⁶	Identify low-value care; Identify barriers and facilitators	Knowledge; Environmental Context and Resources;	—	(1) Identify low-value care: Nurses recognised that physical restraints can lead to negative consequences for patients and their families. (2) Barrier and Facilitator: ICU culture (maintaining patient safety, ways of coping in the ICU, nursing idiosyncrasies); having not receiving any training or education.
Ellen ME (2021) ²⁷	Identify barriers and facilitators; Identify intervention strategies	Social influences; Social/Professional Role and Identity;	Education; Communication between providers; Patient-mediated intervention;	(1) Barrier and Facilitator: difficulty for providers to 'give up', lack of registered nurses' authority and family and patient demands; facilitators: multidisciplinary care provision, nurses' role and the patient-provider relationship. (2) Intervention: strengthening relationships, providing support to healthcare providers and improving communication.
Ellen M (2021) ²⁸	Identify barriers and facilitators; Identify intervention strategies	Knowledge; Skill; Beliefs about Capabilities; Environmental Context and Resources; Social influences;	Education; Teams; Policy decisions;	(1) Barrier and Facilitator: patient-level: well-informed and demanding; physician-level: desire to satisfy patients, lack of confidence, time, skills; system-level: ease of access, lack of alignment and coordination. (2) Intervention: patient dialogue, better teamwork., educational, bottom-up solutions. Policy makers and decision makers should improve patient education and instil confidence and knowledge in physicians.

Bonfill X (2020) ²⁹	Identify low-value care; Identify barriers and facilitators	Knowledge; Optimism;	—	(1) Identify low-value care: 63% of participants reported they were aware of the low-value care recommendations for their corresponding specialty. (2) Barrier and Facilitator: 84.5% stated they agreed with the recommendations and considered them useful.
Kool RB (2020) ³⁰	Identify low-value care; Identify intervention strategies	—	Education; Length of consultation;	(1) Identify low-value care: practitioners are aware of providing unnecessary care. (2) Intervention: better education (guidelines); providing more time for consultation; Local and national media used to educate patients;
Mobrad AM (2020) ³¹	Identify intervention strategies	—	Education;	(1) Intervention: The majority of community pharmacists would like to be provided educational programmes on drug abuse in the future.
Aranaz André JM (2020) ³²	Identify barriers and facilitators	Knowledge; Social influences;	—	(1) Barrier and Facilitator: 64.1% of the respondents were unaware of the Spanish 'Choosing Wisely'; The greatest responsibility for overuse was attributed to physicians, defensive medicine and mass media.
Rietbergen T (2020) ³³	Identify barriers and facilitators	Emotion; Beliefs about Consequences;	—	(1) Barrier and Facilitator: higher valuation of own MRI/arthroscopy experience than existing evidence; belief in the added value.
Osorio D (2020) ³⁴	Identify low-value care; Identify barriers and facilitators	Social influences; Beliefs about Consequences; Environmental Context and Resources;	—	(1) Identify low-value care: 22 recommendations were considered as possibly present in the hospital. In the focus groups, the professionals identified seven more. (2) Barrier and Facilitator: Defensive medicine and scepticism due to contradictory evidence. Facilitators included good leadership and professionals' coordination.
Osorio D (2019) ³⁵	Identify low-value care; Identify barriers and facilitators	Knowledge; Optimism;	—	(1) Identify low-value care: A great understanding of low-value care between nurses. (2) Barrier and Facilitator: A high agreement to recommendations and perception of usefulness.

(Continued)

Table 3 (Continued).

Author (Year)	Process of De-Adoption	TDF (Barriers and Facilitators)	EPOC (Intervention)	Details of Main Findings
Wiencek CA (2019) ³⁶	Identify low-value care; Identify intervention strategies	—	Education; Reminders;	(1) Identify low-value care: nurses were familiar with the Choosing Wisely campaign. (2) Intervention: education, specific protocols, electronic medical record alerts and order sets all raised their awareness of the recommendations.
Blackburn J (2019) ³⁷	Identify barriers and facilitators; Identify intervention strategies	Knowledge; Beliefs about capabilities;	Education;	(1) Barrier and Facilitator: Limited knowledge, lack of confidence (2) Intervention: being informed of new developments.
Kua CH (2019) ³⁸	Identify barriers and facilitators; Identify intervention strategies	Knowledge; Environmental Context and Resources;	Education; Communication between providers; Clinical Practice Guidelines;	(1) Barrier and Facilitator: patients unaware; Lack of knowledge of preferences; Lack of coordination between hospitals and nursing homes; Limited tools; (2) Intervention: Awareness of medications that are unnecessary; Improving quality of life; Improving communication between doctors, pharmacists and nurses; Systematic deprescribing practice and educational tools; Acknowledgement of deprescribing benefits.
Bourgault AM (2019) ³⁹	Identify barriers and facilitators	Knowledge; Beliefs about Consequences;	—	(1) Barrier and Facilitator: difficulty differentiating tradition-based from evidence-based practice; psychological biases related to loss of the practice.
Hofstede H (2019) ⁴⁰	Identify barriers and facilitators	Knowledge; Memory, Attention and Decision Processes	—	(1) Barrier and Facilitator: mismatch between patients and medical professionals regarding testing. Facilitator include updating GPs' knowledge and awareness.

Ellen ME (2018) ^{a41}	Identify barriers and facilitators; Identify intervention strategies	Beliefs about Consequences; Social influences; Social/ Professional Role and Identity;	Education; Organisational culture; Patient-mediated interventions; Length of consultation;	(1) Barrier and Facilitator: fear of litigation, patients' desires; nurses thought that physicians, Ministry of Health, health maintenance organisations, nurses, patients should take responsibility. (2) Intervention: giving physicians evidence-based recommendations, reform protecting physicians from malpractice suits, giving physicians more time to explain alternatives and changing the way physicians are paid for tests and treatments.
Ellen ME (2018) ^{b42}	Identify low-value care; Identify barriers and facilitators; Identify intervention strategies	Social influences; Emotion;	Length of consultation; Patient-mediated interventions; Health information systems;	(1) Identify low-value care: Nurses stated overuse of antibiotics, imaging, blood tests and prenatal surveillance were cited as main areas of health service overuse. (2) Barrier and Facilitator: Patient satisfaction, physician fears and insecurities. (3) Intervention: improving physicians' confidence, increasing appointment times, providing patients more information, implementing computerised system.
Mira JJ (2018) ⁴³	Identify barriers and facilitators; Identify intervention strategies	Social influences; Environmental Context and Resources; Knowledge;	Education;	(1) Barrier and Facilitator: Patient requests and defensive medicine. The lack of time in consultation, patients could find treatments information, contributed to the professional's inability to adequately coping this pressure by patients. (2) Intervention: dissuaded clinical safety and evidence with patients
Patey AM (2017) ⁴⁴	Identify barriers and facilitators; Identify intervention strategies	Social influences; Goals; Environmental Context and Resources; Beliefs about Consequences;	Teams; Organisational culture;	(1) Barrier and Facilitator: competing tasks, time constraints and the necessity to multitask; hospital policies and varying support; negative consequences; positive consequences (eg, avoid unnecessary interventions, mother-centred care). (2) Intervention: support from the entire team and hospital management
Bishop TF (2017) ⁴⁵	Identify barriers and facilitators; Identify intervention strategies	Knowledge; Social influences; Environmental Context and Resources;	Health information systems; Local opinion leaders; Public release of performance data; Education;	(1) Barrier and Facilitator: felt that overuse of low-value services was a significant problem. Patient expectations and lack of time. (2) Intervention: decision support through the electronic medical record, motivation to maintain their reputation among their colleagues, internal motivation to be a good doctor, objective data showing their rates of overuse, alignment of institutional goals and forums to discuss evidence and new research.

(Continued)

Table 3 (Continued).

Author (Year)	Process of De-Adoption	TDF (Barriers and Facilitators)	EPOC (Intervention)	Details of Main Findings
Roman BR (2017) ⁴⁶	Identify low-value care; Identify barriers and facilitators	Emotion; Reinforcement;	—	(1) Identify low-value care: broad recognition of laboratory testing overuse (2) Barrier and Facilitator: endorse the importance of daily testing and fear consequences of less testing; avoid malpractice litigation; protect them from criticism.
Zikmund-Fisher BJ (2017) ⁴⁷	Identify barriers and facilitators	Social influences; Environmental Context and Resources; Beliefs about Consequences;	—	(1) Barrier and Facilitator: malpractice concern, patient requests for services, lack of time for shared decision making and the number of tests recommended by specialists.
Colla CH (2016) ⁴⁸	Identify barriers and facilitators	Knowledge; Emotion; Social influences;	—	(1) Barrier and Facilitator: Knowledge of Choosing Wisely is limited, pressure from patients to order tests, reduce risk of malpractice, the uncertainty involved in patient care disconcerting and not understanding of the costs to the healthcare system.
Grover M (2016) ⁴⁹	Identify barriers and facilitators; Identify intervention strategies	Knowledge;	Education;	(1) Barrier and Facilitator: Familiarity with Choosing Wisely was associated with both greater cost consciousness and less use of low-value services. (2) Intervention: increase cost consciousness, increasing awareness of Choosing Wisely
Buist DS (2016) ⁵⁰	Identify barriers and facilitators; Identify intervention strategies	Knowledge; Emotion; Social influences; Environmental Context and Resources; Intentions;	Education;	(1) Barrier and Facilitator: time constraints, patient preferences, community standards, fear of patients' dissatisfaction, patients' knowledge, availability of tools; clinicians know rising healthcare costs and want to be stewards of limited resources. (2) Intervention: Choosing Wisely campaign may help motivate clinicians to be conscientious stewards of limited healthcare resources.
Palagyi A (2016) ⁵¹	Identify low-value care; Identify barriers and facilitators	Environmental Context and Resources; Social influences;	—	(1) Identify low-value care: acknowledged burden of too many medications. (2) Barrier and Facilitator: the path of least resistance, signalling systems barriers; time constraints; and the organisation of care

Sears ED (2016) ⁵²	Identify low-value care; Identify barriers and facilitators	Beliefs about Consequences; Emotion; Environmental Context and Resources;	—	(1) Identify low-value care: Most clinicians agreed with the recommendations. (2) Barrier and Facilitator: clinicians felt they would be unable to refer the patient to a specialist for further evaluation without obtaining imaging first., worried that the patient would be upset, not have time to discuss the risks and benefits of imaging with the patient, worry that leave them vulnerable to a malpractice claim.
Miller J (2015) ⁵³	Identify low-value care; Identify barriers and facilitators	Knowledge;	—	(1) Identify low-value care: most respondents were able to correctly determine what is low-value care. (2) Barrier and Facilitator: For other less well publicised practice changes, the respondents were less aware.
Maughan BC (2015) ⁵⁴	Identify low-value care; Identify barriers and facilitators	Optimism;	—	(1) Identify low-value care: 80% respondents were aware of Choosing Wisely. (2) Barrier and Facilitator: A majority of participants anticipate the programme will decrease costs of care and use of diagnostic imaging.
Muir-Cochrane EC (2015) ⁵⁵	Identify barriers and facilitators; Identify intervention strategies	Environmental Context and Resources;	Education; Organisational culture;	(1) Barrier and Facilitator: Lack of accessible alternatives, adverse interpersonal environment, unfavourable physical environment and practice environment contributes to restraint and seclusion. (2) Intervention: providing appropriate education and support and addressing ethical and workplace cultural issues surrounding these practices.
PerryUndemResearch (2014) ⁵⁶	Identify barriers and facilitators; Identify intervention strategies	Emotion;	Clinical Practice Guidelines;	(1) Identify low-value care: Physicians clearly recognise the problem of unnecessary tests and procedures in the healthcare system. (2) Barrier and Facilitator: malpractice concerns, reassure physician themselves. (3) Intervention: having specific, evidence-based recommendations around unnecessary care that they can use to discuss with patients.
He AJ (2014) ⁵⁷	Identify barriers and facilitators;	Reinforcement; Social influences;	—	(1) Barrier and Facilitator: hard economic incentives, doctors' motive of avoiding disputes with patients.

(Continued)

Table 3 (Continued).

Author (Year)	Process of De-Adoption	TDF (Barriers and Facilitators)	EPOC (Intervention)	Details of Main Findings
Han PK (2013) ⁵⁸	Identify barriers and facilitators;	Environmental Context and Resources; Beliefs about Capabilities; Beliefs about Consequences;	—	(1) Barrier and Facilitator: smaller practice size, lower patient volume and practice ownership; older age, international medical graduate status, lower self-efficacy and greater perceptions of ambiguity regarding survivorship care.
Patey AM (2012) ⁵⁹	Identify barriers and facilitators;	Social/professional role and identity; Beliefs about capabilities; social influences; Environmental context and resources; Beliefs about consequences; Goals; Behavioural regulation;	—	(1) Barrier and Facilitator: Conflicting about who was responsible for the test-ordering; inability to cancel tests ordered by fellow physicians; tests being completed before the anaesthesiologists see the patient; surgeons ordered tests they thought anaesthesiologists may need. Conflicting comments about the potential consequences associated with reducing testing, a gap between motivation and practice.
Sirovich BE (2011) ⁶⁰	Identify barriers and facilitators; Identify intervention strategies	Emotion; Environmental Context and Resources; Goals;	Length of consultation; Policy decisions; Pay for performance;	(1) Barrier and Facilitator: Malpractice concerns, clinical performance measures, inadequate time to spend with patients. (2) Intervention: Malpractice reform, realignment of financial incentives, more time with patients.

In the studies included in this review,^{24–60} “education” was commonly identified as an effective intervention strategy by healthcare personnel, whether doctors or nurses, to reduce low-value care. The Cochrane review⁶⁵ of the effects of continuing education on professional practice and health outcomes also showed that compared with no intervention, educational meetings as the main component of an intervention probably slightly improve professional practice. Educational meetings may improve compliance with desired practice to a greater extent than other kinds of behaviour change interventions. In our review, healthcare personnel also identified extended consultation times and the development of an organizational culture as effective intervention strategies for reducing low-value care. However, an important question remains: should education be combined with other strategies, and if so, how? Currently, approaches such as the Multiphase Optimization Strategy (MOST) offer a method for combining and evaluating intervention strategies by optimizing the delivery of active program components within an optimal portfolio. Thus, further research is needed to explore how different strategies can be integrated and applied effectively.

Strengths and Limitations

The results of this review influence ongoing and upcoming programmes that aim to understand and reduce low-value care. Future researchers and clinical managers should focus on addressing these barriers to reducing low-value care summarised in this scoping review. The effective intervention strategies identified from healthcare personnel’s perceptions in this review should also attract the attention of future researchers. To determine which intervention strategies for reducing low-value care are most likely to succeed, it is necessary for empirical researchers to evaluate intervention strategies for identifying potential low-value care and thereby identify the best strategies.

Although medical librarians help to perform our electronic database search meticulously, some relevant studies were likely to have been overlooked. This could have occurred because the search was limited to English-language sources and there were no MeSH phrases to help search low-value care research, which necessitated via means of numerous relevant synonyms and related terms.

Conclusions

Some previous studies have explored healthcare personnel’s perceptions regarding reducing low-value care. According to current research, healthcare personnel’s perceptions are focused on identifying low-value care, barriers and facilitators to reducing low-value care and intervention strategies to reduce low-value care. Education and changing the length of consultation and organisational culture are potential main effect intervention strategies to address the main barriers to reducing low-value care (eg lack of knowledge, lack of environmental context and resources, social influences). Future research should develop and implement appropriate intervention strategies to reduce low-value care according to healthcare personnel’s perceptions.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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