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Disinvestment in healthcare: a scoping review of systematic reviews

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Abstract

Objectives: Disinvestment from low value health technologies is growing globally. Diverse evidence gathering and assessment methods were used to implement disinvestment initiatives, however, less than half of the empirical studies report reduced use of the low-value services. This scoping review aimed to synthesize the information from available reviews on the concepts and purposes of disinvestment in healthcare, the approaches and methods used, the role of stakeholders and facilitators and barriers in its implementation.

Methods: This scoping review was guided by the Joanna Briggs Institute Manual for Evidence Synthesis and PRISMA statement for scoping review. Published reviews on disinvestment were identified from scientific databases including health technology assessment (HTA) Web sites using the terms "disinvestment," "health technology reassessment," and "healthcare." The data obtained was synthesized narratively to identify similarities and differences across the approaches based on the prespecified categories.

Results: Seventeen reviews were included with thirty-four initiatives identified across sixteen countries at various levels of implementation and responsible agencies for the activities. Two most used methods to facilitate disinvestment decisions are Programme Budgeting and Marginal Analysis (PBMA) and HTA. Stakeholder involvement is the most important aspect to be addressed, as it acts as both facilitator and barrier in disinvestment initiatives implementation.

Conclusions: Disinvestment programs have been implemented at multilevel, involving multi-stakeholders and using multiple methods such as PBMA and HTA. However, there is a lack of clarity on the additional dimensions of technical analysis related to these tools. Further research could focus on technology optimization in healthcare as part of overall health technology management.

Health systems across the globe are increasingly recognizing that in ensuring the efficient delivery of care, it is crucial to complement judicious investment in new healthcare technologies with strategies to reduce the use of ineffective and inefficient interventions. These strategies, commonly referred to as disinvestment initiatives, are a growing priority for international health policy in maximizing value and improving quality of care (1). However, removing resources from a health system is more difficult than adding new resources with many existing technologies having been diffused into service delivery before evidence-based clinical and cost-effectiveness criteria were applied. Furthermore, as new health interventions come along, the older ones may no longer offer comparable values. In addition, the lack of consistent and transparent systems to identify these technologies contributes to a degree of clinical and cost-effectiveness uncertainty (2).

Numerous studies on disinvestment initiatives and health technology reassessment (HTR) have been published, describing processes at various levels. However, the success of the initiatives such as "Choosing Wisely" campaigns, the National Institute for Health and Care Excellence (NICE) "Do Not Do" list in England and the US Preventive Services Task Force has been mixed, with less than half of identified studies reporting a reduction in the utilization of these low-value services (3). Additionally, the global COVID-19 outbreak has forced many countries to devote a significant portion of their resources to combating the pandemic. Early estimates in twenty-two countries, mostly high-income economies, show that healthcare spending rose significantly in 2020, more than in previous years (4). Therefore, promoting active disinvestment in this current climate is timely to help restrategize value-based priority setting and resource reallocation to aid economic recovery.

We undertook a scoping review of existing reviews to comprehensively synthesize the large body of information from published studies on disinvestment in healthcare. The aim of this scoping review was to describe the approaches and methods used in disinvestment processes of health technologies. We also identified the facilitators and barriers with regards to carrying out disinvestment and explore the role of stakeholders particularly among clinicians who act as a bridge between policy makers and patients.

Methods

The Scoping Review Protocol

A priori protocol was developed following established scoping review frameworks from the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis (5). The reporting of this study conforms to the PRISMA statement for scoping review standards or PRISMA-ScR (6).

Purpose Statement of the Scoping Review

The purpose of this scoping review is to clarify the concepts and definitions of disinvestment in the published literature and identify key characteristics of existing disinvestment initiatives that had been implemented. In achieving these, we intended to map the data from the retrieved studies based on five categories: (i) concepts and terms used in disinvestment in healthcare; (ii) purpose of disinvestment; (iii) methods and processes in disinvestment; (iv) stakeholder involvement in disinvestment; and (v) facilitators and challenges in disinvestment implementation.

Systematic Search Strategy

Identification

The main electronic bibliographic databases used for evidence searching: MEDLINE (Ovid), Embase, Web of Science, and Scopus. Other sources used were NIHR Journals Library, Centre for Reviews and Dissemination as well as health technology assessment (HTA) Web sites and databases (INAHTA and HTAi). Based on a scoping review by Niven et al. (7) on deadoption in healthcare, forty-three terms on "disinvestment" were identified, including "HTR," "delisting," and "deimplementation" (Supplementary Table 1). Focusing on healthcare disinvestment, our search strategy was confined to fourteen synonyms of "disinvestment" and combined with "healthcare" or "health care" (see Supplementary Tables 2 and 3). The initial search was conducted on 4 Feb 2021 and repeated on 3 Jan 2022 to identify any additional publications. Literature was also identified from the references of the retrieved articles using citation tracking, snowballing method and recommendation by experts' in conferences or forums.

Inclusion and Exclusion Criteria

Specific inclusion and exclusion criteria were established to include all review types containing terms and concepts, descriptions or methods relating to disinvestment in healthcare (see Supplementary Table 4). These criteria were applied using automatic sorting function in the databases and manually. A publication period was determined to ensure that we included the papers that are contemporary and relevant to current practice, without jeopardizing the concept of "research field maturity" (8). For practicality, we only include articles published between year 2001 and 2021 which considered as acceptable to perform a representative review on disinvestment in healthcare. Additional automatic screening filters were applied for English only and types of research ("review articles" or "reviews").

Screening and Eligibility

The titles and abstracts of the articles were checked to ensure that the studies matched the predetermined inclusion criteria. A paper was considered eligible if it was secondary research on disinvestment initiatives, such as systematic reviews, scoping reviews, pragmatic reviews, overviews, interpretative reviews, and critical interpretative synthesis. An article was included when the study covered any of the components outlined in the inclusion criteria. The lead author carried out the initial screening and the results were presented to the coauthors for checking.

Data Extraction, Synthesis, and Analysis

Data were extracted using a predesigned data extraction table and synthesized narratively to identify similarities and differences across the approaches. The general description and findings from each article included in the review were summarized according to the following characteristics: publication year, type of reviews, country, organization or agency in charge of the program, scope of health technologies, methods used and description on disinvestment initiatives including the process, stakeholder involvement, as well as facilitators and barriers in its implementation.

Content analysis was employed to identify the pattern of data, and the findings were organized into the stated categories using shared similarities or relationships of the information (9). Descriptive data analyses were performed to report the frequencies and quantitative findings from the included reviews.

Results

Seventeen reviews on disinvestment initiatives were included for synthesis and analysis, as shown in PRISMA flow diagram (Figure 1). Eight reviews described international disinvestment initiatives with descriptions on countries that already implemented disinvestment programs (3;7;11–16). Two of the included studies discussed regional disinvestment initiatives, in European HTA agencies (17) and in Latin American countries (18).

Whilst the majority ($n = 13$) of the included reviews described disinvestment for health technologies and services in general (3;7;12–15;17–23), two reviews focused on disinvestment strategies in pharmaceuticals (11;24) and two studies on nonpharmaceuticals (16;25). Four of the reviews proposed methods or frameworks for disinvestment or HTR (7;13;21;22), mainly for identification and prioritization processes. One review specifically explored the related terms and definitions in disinvestment using "deadoption" as the key term (7), and one review focused solely on stakeholders' involvement in disinvestment, specifically healthcare professionals (25).

We identified thirty-four disinvestment initiatives across sixteen countries, operating at various levels by different types of agencies responsible for carrying out the activities (Figure 2). Among the programs implemented internationally, the most quoted is the Choosing Wisely campaign launched in 2012 by the American Board of Internal Medicine and adapted by many countries and agencies. The majority of national level initiatives fall under the responsibility of the HTA agencies in that country (12). Uniquely, Canada and Spain initially started with regional-based disinvestment initiatives before expanding to a national program (13).

There are several information gaps on some of the implemented programs. For example, from the review in Latin American countries (18), there are only few documented records of disinvestment activities despite various programs that have been carried out in the region based on survey responses conducted. Another example is the Danish Centre for Health Technology Assessment's (DACEHTA) pilot on disinvestment, in which the only source of information on this project was a 2005 conference abstract on the improper utilization of imaging technologies in Denmark (16).

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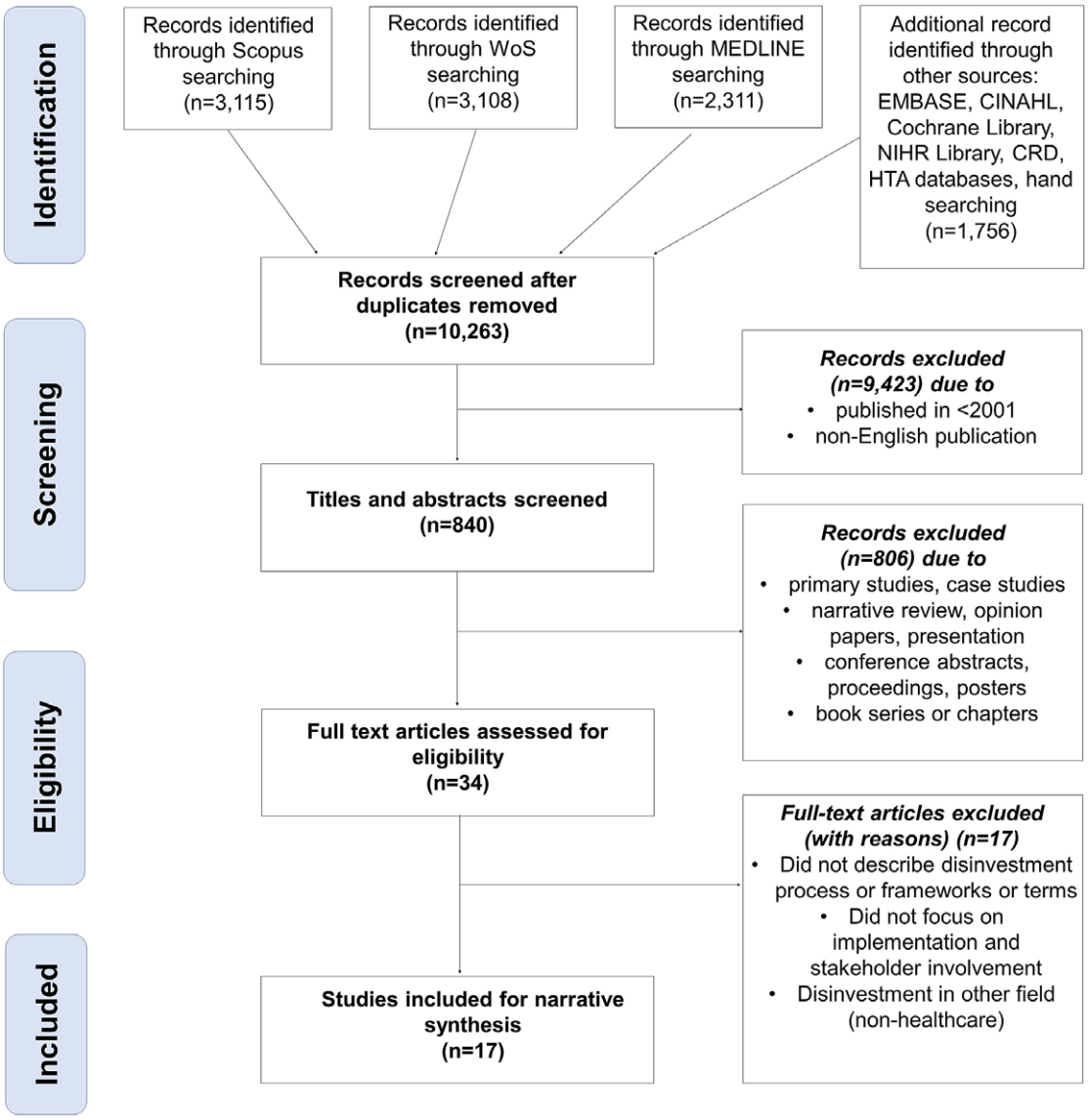

Figure 1. PRISMA flow diagram of the scoping review (10).

Supplementary Table 5 summarized the details of the included studies and description of disinvestment initiatives based on the predefined categories.

Clarifying Concepts and Terms in Disinvestment

Six reviews highlighted the need to clarify the concepts and terms used in disinvestment (7;11;14;16;20;22). Among the reasons given are to provide a clearer vision regarding managing existing technologies in the system (22), to enhance communication (20) and to improve engagement among the stakeholders (11).

Due to overlapping concepts, stakeholders involved in managing healthcare resources tend to use disinvestment interchangeably with the following terms; rationing (26), HTR (13) and obsolete technologies (11;14) (Table 1). The earliest definition of disinvestment by Elshaug et al. (27) focused on the withdrawal of resources in reducing ineffective, harmful or low-value medical services with the aim of improving health of patients. Rationing has, instead, the underlying premise of scarce resources; meaning the prioritization of resources will result in certain services being excluded from funding, thus denying people from potentially beneficial services (20). HTR is the process of identifying low value practices that may or may not lead to disinvestment decision. It is more acceptable to stakeholders as it does not assume the removal of funding (11) and is not meant as a rationing tool.

Understanding the Purpose of Disinvestment

Although disinvestment is frequently associated with budgetary concerns and affordability, it can also be prompted to enhance efficiency and quality of care through reformation of service provision (26). Based on our analysis (see Supplementary Tables 5 and 6), the purpose of disinvestment initiatives can be grouped into four themes (Figure 3): (i) enhance value-based spending (13;14;16–19;25); (ii) resource reallocation (3;12;14–21;24;25); (iii) improving quality of health care (3;7;11–14;16;19;21;22;25); and (iv) informed policy making (12;17). Clarifying the goals of disinvestment would help people understand that it is a tool for improving access to

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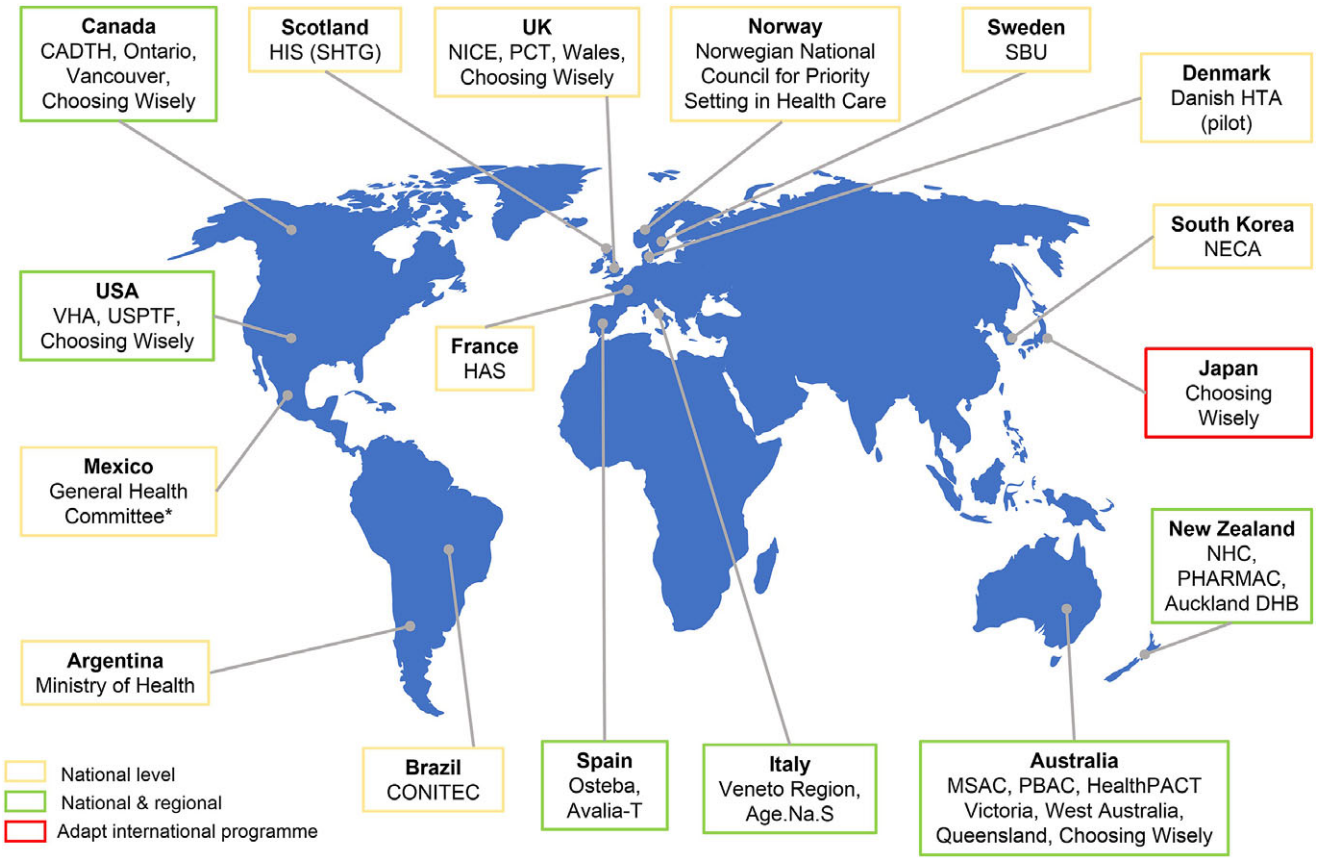

Figure 2 . Countries with identified disinvestment initiatives and the agencies involved. Agencies acronyms: Age.Na.S, Agency for Regional Healthcare; CADTH, Canadian Agency for Drugs and Technologies in Health; CONITEC, Brazilian National Committee for Technology Incorporation; DHB, District Health Board; HAS, Haute Autorité de Santé Compréhensive Drug Review; HealthPACT, Health Policy Advisory Committee for Technology; MSAC, Medical Services Advisory Committee; NECA, National Evidence-based healthcare Collaborating Agency; NHC, National Health Committee; NICE, National Institute for Health and Care Excellence; PBAC, Pharmaceutical Benefits Advisory Committee; PCT, Primary Care Trusts Programmes; PHARMAC, Pharmaceutical Management Agency; SBU, The Swedish Council on Health Technology Assessment; SHTG, Scottish Health Technologies Group; USPTF, US Preventive Services Task Force (grade D recommendations); VHA, Veterans Health Administration Comprehensive Review. *General Health Committee agreed on eight types of drug exclusions. No information was provided.

Table 1. Definitions of Terms

Disinvestment	• The process of (partially or completely) withdrawing health resources from any existing healthcare practices, procedures, technologies, or pharmaceuticals that are deemed to deliver little or no health gain for their cost, and thus are not efficient health resource allocations (27)
Rationing	• The full or partial withdrawal of resources from a medical service that is clinically expected, on average, to result in a patient achieving diminished health benefits (20). It may result in exclusion of services from public funding, hence denying people from potentially beneficial technologies
Health technology reassessment	• A structured, evidence-based assessment of the clinical, social, ethical, and economic effects of a technology currently used in the healthcare system, to inform optimal use of that technology in comparison to its alternatives (11)
Obsolete technologies	• Any health technology in use for one or more indications, whose clinical benefit, safety, and/or cost-effectiveness have been significantly superseded by other available alternatives or are not supported by evidence (11;14)

effective solutions, not for eliminating technologies and withdrawing resources on a large scale.

Methods and Processes in Disinvestment

Most of the reviews ($n = 15$) described processes and methods of disinvestment. Generally, the disinvestment process includes identification, prioritization, assessment or reassessment, decision, and dissemination (Table 2). In some reviews, implementation and monitoring of the decision were also included in the process. Identification and prioritization were the least standardized in terms of methods, criteria and evidence used across HTA agencies. In certain contexts, there is overlap in these processes, which potentially lead to some confusion in the roles and criteria.

Identification Process

Three components related to identifying candidates for disinvestment were *triggers* for identification, *source* of identification and *implementation* of the process (Supplementary Table 7). Identification can be done through established methods such as Horizon

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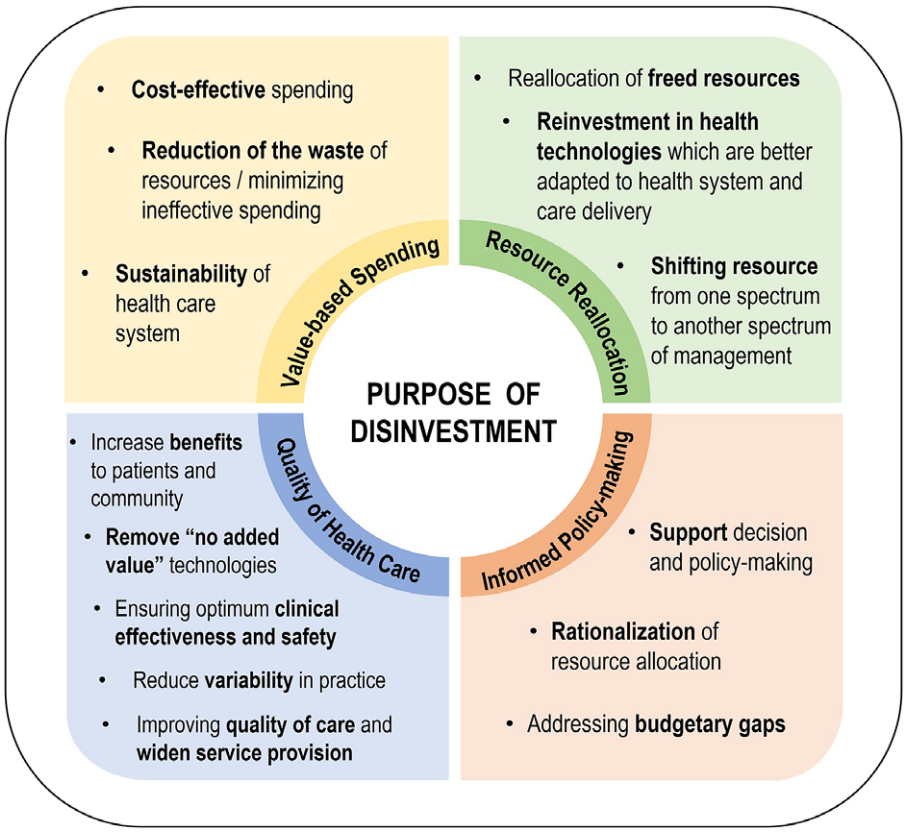

Figure 3. Rationale and purpose of disinvestment.

Scanning or based on the input from clinical experts and program managers. It can also be linked with the HTA process that assumes a "one-in-one-out" policy in which, for each new technology considered, the current technology is also taken into consideration for reassessment (16).

Identifying candidates for disinvestment can be performed in two ways, "*ad hoc* methods" and "embedded methods." *Ad hoc* methods are specifically devised and implemented to find suitable technologies for disinvestment and usually are not carried out on a regular basis (21). For embedded methods, the identification process is performed routinely alongside other organizational activities (21).

Prioritization Process

Eleven reviews outlined common prioritization criteria such as the evidence on efficiency or effectiveness, cost-effectiveness and safety of the technology, existence of available alternatives, the total cost, and disease burden. These criteria are usually aligned with the purpose of disinvestment, for example, the rationale for inclusion of "cost of inefficient drugs" from a budgetary planning is to allow for investment in technologies with higher value (11).

A specific tool for prioritization, the PriTec Prioritization Tool develop by Galician Agency for Health Technology Assessment was mentioned in three included reviews (11;13;17) (Supplementary Table 8). It is a three-domain weighted prioritization exercise with a score system that allows for the ranking of health technologies according to a set of specified criteria (17). Additional criteria for prioritization process include evidence of futility (12;13), strength of supporting evidence on lack of efficacy (7;24), cost (12–14) and opportunity cost (15).

Assessment Process

There is little information from the retrieved articles on technical assessment for disinvestment. Twelve articles included methods similar to the components used in HTA for investment: disease burden, safety, clinical and cost-effectiveness, and overall value including ethical, legal, and social aspects (Table 2). It was highlighted that an assessment should also evaluate the feasibility of implementation and analysis of consequences, both intended and unintended (11).

We identified two commonly used frameworks to facilitate disinvestment decisions, namely Program Budgeting and Marginal Analysis (PBMA) and HTA. It is argued that PBMA is usually used to assess the distribution of resources for health services within a fixed budget plan, while HTA is mainly focused on single technology appraisals for public and social healthcare system and is not a framework specifically intended for disinvestment (13). Other method is Accountability for Reasonableness (A4R) which was applied in Sweden's healthcare priority setting to address the concepts of rationing, rationalization, ranking priority setting, and structured quality improvement (15). However, the information on A4R as method for disinvestment is scarce and limited to Swedish healthcare setting.

Type of Disinvestment Decisions

The outcomes of disinvestment decisions were mixed. Some reviews highlighted the requirement of making decisions (i.e., binding judgments) (13;14;20), while some outlined the resulting outcomes that may occur following the assessment (i.e., nonbinding information) (3;11;15;18;22;24). According to Mayer and Nachtnebel (14), the implementation of disinvestment

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Table 2. Summary of Disinvestment Methods/Processes, Facilitators, and Challenges

	Description on disinvestment process/methods					Facilitators and challenges in implementation	
References	Identification	Prioritization	Assessment	Decision	Dissemination	Facilitators	Challenges
Walsh-Bailey et al. (19)	Not specified	(i) Clinical and cost ineffectiveness	(i) PBMA (ii) HTA/HTR	Based on action targets: (i) Reduce (ii) Replace (iii) Restrict (iv) Remove	Not specified	Stakeholder involvement (multicomponent interventions involving patients and providers)	Not specified
Mitchell et al. (25)	Not specified	Not specified	Not specified	Not specified	Not specified	(i) Engaging clinical champions to lead change (ii) Using rigorous patient outcome data (iii) Transparent decision-making processes	Negative responses by health professionals: (i) staff feel anxiety, disempowered, disrespected; (ii) distrust the process; (iii) Dismiss the directive to disinvest; (iv) misperception on the purpose of disinvestment
Embrett et al. (20)	(i) New evidence (ii) >Introduction of a new technology (iii) Budget restrictions	(i) Clinical and cost-effectiveness (ii) Value assessment (iii) Stakeholder consultation	(i) HTA/HTR	Transparent decision making on medical service withdrawal (policy option)	(i) Guidelines (ii) Education for public, training for providers (iii) Monitoring of service use	Stakeholder involvement as a factor in the success of initiative	Not specified
Esandi et al. (21)	Three different but related themes on methods for identifying candidates for disinvestment; approaches, triggers, and methods (ATM) – *Ad hoc* method – Embedded method	Not specified	Not specified	Not specified	Not specified	(i) Transparent, systematic, evidence-based approach (ii) Flexible method by HTA organization/ country according to suitability (iii) Inclusion of stakeholders perceptions increases legitimacy in decision making	(i) Additional workload for HTA units (ii) Variation in processes for selecting and prioritizing candidates for disinvestment—causes dispute if the decision is to disinvest
Calabrò et al. (17)	*Source:* (i) expert panel (ii) Literatures (iii) New/rising technology databases (iv) consultation with NHS, hospital	(i) PriTec Tool—prespecified criteria based on three domains	(i) HTA method (majority) (ii) PBMA (Making choices spending wisely, MaCS-Wise)	Not specified	(i) NICE "Do not do" databases (passive) (ii) GuNFT (active)	Regional and international platform for discussion	A complex process—requires inputs from all relevant stakeholders
Soril et al. (22)	Not specified	Not specified	Value assessment	Utilization of technology (increased, unchanged, decrease,	Not specified	(i) The entire HTR process is a collective involvement of foundational stakeholders	(i) Limited success due to insufficient engagement with and from stakeholders (ii) Top-down initiatives

(*Continued*)

Table 2. (*Continued*)

References	Description on disinvestment process/methods					Facilitators and challenges in implementation	
	Identification	Prioritization	Assessment	Decision	Dissemination	Facilitators	Challenges
				complete exit of technology from the healthcare system			without support from the top leads to disengagement among stakeholders tasked with implementation
Agirrezabal et al. (18)	Not mentioned	Not mentioned	(i) Cost analysis (ii) Retrospective study of adverse events notification	Mixed of disinvestment decisions, but not monitored	(i) Publications (ii) Technical reports	Not mentioned	Moving away from the public's understanding of "across the board cuts"
Chambers et al. (3)	Not specified. Programmes implemented:—Choosing Wisely—NICE Initiatives—US Preventive Services Task Force (grade D recommendation)	Not mentioned	Not specified. Programmes implemented:—Choosing Wisely—NICE Initiatives—US Preventive Services Task Force	The decisions and success of disinvestment initiatives has been mixed	(i) NICE "Do not do" databases	Continuous promotion of the disinvestment initiative among practitioners is the key success	(i) Gaining acceptance from the frontline service provider (ii) Obtaining adequate resources to support disinvestment initiatives
Maloney et al. (11)	(i) Search, monitoring, review of literature and databases (ii) Fixed time or trigger for reassessment (iii) Efficient and transparent processes	(i) Stakeholder consultation and assessment of variation in technology use—methods for identification or prioritization or both (ii) Fixed time or trigger for reassessment (iii) Efficient and transparent processes	(i) Stakeholder involvement in therapeutic review assessment (ii) HTA method, including value assessment and opportunity cost	Disinvestment recommendation may result, but reinvestment in other drug technologies is also possible	(i) Passive: publication on databases or Web sites (ii) Active: incorporate in guidelines or decision support tools, changes to formulary and/or coverage reimbursement listings	(i) Transparent process—promote acceptance among stakeholders (ii) Using a more neutral term—"reassessment" instead of "disinvestment" (iii) Adoption of fixed time HTRs or therapeutic reviews—increased engagement with stakeholders	(i) Lack of political will and leadership (ii) Hesitancy from stakeholders to allocate resources for disinvestment initiative (iii) Variability in reimbursement and purchasing methods (iv) Low engagement from stakeholders and decision makers (v) Resistant to losing access to a drug therapy that may still provide some benefit
Orso et al. (12)	Depends on agencies/programme. – New evidence – Temporal variation – Conflicting with guidelines – Public interest/controversy	(i) Cost of service (ii) Impact on health, equity (iii) Disease burden/population affected (iv) Futility,	(i) PBMA, HTA (ii) Scientific and colloquial data (iii) Macro-marginal analysis (iv) Technology appraisal (v) cost-	Not mentioned	(i) Printed/online (ii) HTA reports, commissioners' guides (online) (iii) Databases ("Do Not Do," Uncertainties database)	The existence of HTA agency in the country is a strong predictor of the presence of disinvestment programs ($p = .034$)	Not mentioned

(*Continued*)

Table 2. (*Continued*)

References	Description on disinvestment process/methods					Facilitators and challenges in implementation	
	Identification	Prioritization	Assessment	Decision	Dissemination	Facilitators	Challenges
	– Effectiveness and safety issues – Evidence-based consensus – Utilization rate	obsolescence (age, type) (v) Access/ capacity (vi) Sustainability (vii) System integration	effectiveness analysis (CEA) (vi) Critical appraisal of the evidence on uncertainties		(iv) Short report and reviews (online)		
Seo et al. (13)	Similar criteria across countries: (i) Clinical guidelines (ii) New evidence on safety and effectiveness (iii) Public interests (iv) Variation in practices (v) Leakage (vi) Legacy items Spain: use Guideline for Not Funding existing health Technologies	(i) Cost of services (ii) Risk/benefit of technologies (iii) Disease burden (iv) Patient preferences (v) Evidence of futility Spain: use PriTec Tool, which based on three domains	(i) PBMA (ii) HTR (not much different from HTA, but requires convincing evidence of at least no risk, or of a benefit, in removing the technology)	(i) Transparent, supported by robust evidence (ii) Appropriate knowledge transfer to all stakeholders – Specific committee or council of experts and stakeholders involve at various level – Eight outcomes of HTR	(i) Reports: technology appraisal, recommendation reminders, commissioning guidelines (ii) Do Not Do database (iii) Knowledge transfer (conferences) (iv) Email to stakeholders	(i) Continuous knowledge transfer to educate stakeholders in PBMA (ii) Stakeholder involvement (developing strategies for disinvestment)—from early phase to implementation (iii) Spain—regulatory support at national level (Royal Decree 1030)	(i) Lack of political motivation (ii) Decentralized health system and evaluation (iii) Technical difficulties of HTR processes (iv) Reluctance in withdrawal (clinicians) (v) Perception—removing an established intervention is harder than refusing new one of similar value (vi) Absence of robust evidence to support disinvestment
Mayer et al. (14)	(i) Literature-based and expert-related (ii) Criteria: overlap between effectiveness, efficiency/cost/cost-effectiveness, available alternatives and benefit (iii) Involvement of physician is crucial Programmes mentioned: Choosing Wisely, NICE initiatives, GuNFT, Australia PBAC and MBS, Cochrane Quality and Productivity topics	(i) Spain (Osteba) standardized tool, PriTec Prioritization Tool (ii) Criteria are identical in majority of the programs, with cost/efficiency most frequently mentioned	(i) HTA (ii) PBMA	(i) Strategy for implementation: GuNFT and NICE program (ii) Choosing Wisely: relies on physicians to implement recommendation and encourages patients/ consumers to discuss involve in treatment options (iii) PBAC, MBS: decisions are transferred into benefits schemes (direct) (iv) PBMA: recommendation directed at specific organizations	(i) HTA reports or concise lists summarizing the recommendation (ii) Active (published online, print media, face-to-face communication with target groups or consumer organizations, commissioning guides) (iii) Passive (database in Web site)	(i) Broad involvement of stakeholders (ii) Structured and evidence-based process, with transparent methods (iii) Targeted group for dissemination strategy (iv) Consideration of local contexts (v) Encouragement of political discussion and raising awareness before and during program	(i) Additional human and financial resources (ii) Implementation strategy not well-planned (iii) Lack of support from decision makers and an absence of strong leadership

(*Continued*)

Table 2. (*Continued*)

	Description on disinvestment process/methods					Facilitators and challenges in implementation	
References	Identification	Prioritization	Assessment	Decision	Dissemination	Facilitators	Challenges
Niven et al. (7)	Review of available evidence combined with stakeholder engagement	(i) Availability of evidence (harmful or ineffe-ctiveness) (ii) Safety issues (iii) Potential health and cost impact of deadoption (iv) Availability of alternative practices	(i) PBMA (ii) HTA/HTR	Not specified	Not specified	(i) Early stakeholder engagement during identification and prioritization allow implementation of deadoption process and improve the probability of success	Not mentioned
Parkinson et al. (24)	(i) Concerns on quality, cost and clinical effectiveness, higher than utilization and/or international differences (ii) Changes in evidence, regulatory status, or budget impact (iii) Routine for all listed drugs (France) (iv) Drugs with price competition (v) Leakage: drug utilization (NZ)	(i) Evidence of insufficient safety, clinical- and cost-effectiveness after multiple technology assessment (ii) SMR ratings (France): effectiveness, safety, disease severity, impact on individual health and public health alternatives (iii) Not delivering value for money	Not mentioned	(i) Drug delisting (ii) Restricting treatment (iii) Price or reimbursement rate reductions (iv) Encourage generic prescribing (v) Coverage with Evidence Development (CED)	Not mentioned	Stakeholder involvement: (i) Help diffuse any resulting politics (ii) Communicating with stakeholders upfront and throughout the process regarding what research is required and what level of evidence is needed for continuing funding the drug	(i) Disinvestment removes subsidy to patient, restricts clinical autonomy, and reduces prescriber and patient choice (ii) Resistance to change practice among clinicians (iii) Insufficient information to patients leads to misunderstanding
Garner et al. (23)	(i) Potential productivity and cash- savings (ii) Potential impact on quality of clinical care and outcomes (iii) Potential impact on patient safety (iv) Potential impact on patient and carer experience	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	(i) Recommendation not applicable to local healthcare setting (ii) Framework and recommendation not relevant to clinical practice (iii) Specific review/ assessment found an *absence of evidence* rather than evidence of a lack of efficacy and effectiveness —Cochrane using randomized trials

(*Continued*)

Table 2. (*Continued*)

	Description on disinvestment process/methods					Facilitators and challenges in implementation	
References	Identification	Prioritization	Assessment	Decision	Dissemination	Facilitators	Challenges
Polisena et al. (15)	Not mentioned	(i) Disease burden (ii) Clinical effectiveness and safety (iii) Cost-effectiveness, opportunity cost (iv) Health services impact (ethical, legal, psychosocial) (v) Stakeholder and public engagement (vi) Data sources	(i) PBMA (majority) (ii) HTA (iii) Accountability for Reasonableness (A4R) and quality improvement theory—Sweden	(i) Reduce utilization, interventions discontinued (ii) Changes in resource allocation (iii) Cost reduction in overall management of the specific condition (iv) No change (adequate funding)	Not mentioned	(i) Interdisciplinary panel: executives, directors, managers, clinical leads, physicians, specialists, researchers and academics, health economists—robust decision making (ii) Patient/community representatives—improve acceptability (iii) PBMA—transparent and structured framework	(i) PBMA—uncertainty on whether the correct decisions were made (ii) PBMA—require training and sufficient time to be executed (iii) Insufficient clinical effectiveness, safety studies, or cost data—difficult to make evidence-based recommendations (iv) HTA—focused on specific technologies, principally in fee-for-service structures
Leggett et al. (16)	Depends on programmes/specific country (e.g., NICE initiative, Choosing Wisely, and GuNFT)	(i) Using existing tools for priority setting in resource allocation (similar with HTA) (ii) PriTec Tool (iii) “One in, one out” policy	(i) HTA (majority) (ii) PBMA	Not mentioned	(i) HTA reports (ii) “Do Not Do” databases (iii) Choosing Wisely database (iv) Technical reports and commissioning guides	A standard and tested approach for HTR, which include stakeholder engagement in addressing resource allocation—enable more countries to begin reassessing health technologies	(i) Resistance to change practice among clinicians (ii) Obtaining buy-in from stakeholders is difficult (iii) Additional cost for human and financial resources

HTA, health technology assessment; HTR, health technology reassessment; PBMA, Programme Budgeting and Marginal Analysis.

decisions may result in one of these four conditions: (i) a change in application or scope of use; (ii) full or partial resource withdrawal; (iii) complete removal from practice, or (iv) no change to the practice. However, the impact of these decisions on resource withdrawal must be judicially evaluated for their influence on patients' health based on the clinical effectiveness and on the availability of a suitable alternative (20).

Dissemination Process

Active dissemination through online or printed recommendation reminders, HTA reports, commissioners' guides, clinical guidelines, and journal publications were the most common means (11–14). It can also be done through conferences and knowledge transfer programs (13), face-to-face communications with target groups (14), and making direct changes to formulary or reimbursement listings (11). In Spain, a software was embedded with the Guideline for Not Funding existing health Technologies in the health system whereby progress and reports are emailed to the stakeholders once the evaluation is completed (13;17). More passive dissemination include publishing the recommendation lists on Web sites such as "Do Not Do" and Choosing Wisely, in online uncertainties databases and short reports (12).

Stakeholders Involvement in Disinvestment Initiative

Only one systematic review by Mitchell et al. (25) focused on capturing healthcare staff perspectives and reactions toward disinvestment initiatives. In other reviews, the roles of stakeholders were described and discussed mainly in the context of the processes, facilitators, and barriers of disinvestment programs (see Table 2).

Stakeholders usually involved are clinicians and other first-line responders in care provision, clinical and political decision makers, patients or their representatives, researchers, health economists and academics, as well as citizens representing the public (12). They may be involved as members of a special committee, for instance, members of the Technology Appraisal Committee under NICE are drawn from the National Health Service, patient organizations, academia, and pharmaceutical or medical device industries (13).

Facilitators and Challenges to Disinvestment Initiatives

We identified several facilitating factors. First, the participation of a diverse range of stakeholders with varying roles and expertise is a critical factor in increasing program acceptance (3;7;13;14;20;25). This, combined with an evidence-based strategy and transparent process, further enhanced the acceptance (7;11;13;14;21;22;25). Thirdly, the consideration on local context when evaluating the candidates for disinvestment and in formulating recommendations facilitates implementation (7;14;18;21). Various dissemination strategies were also customized to relevant target groups, making the information more acceptable and comprehensible (11;12;14;20).

Several main challenges and barriers were identified and grouped into three categories, namely *perception barriers*, *technical or scientific barriers*, and *organizational barriers.*

Perception Barriers

Healthcare professionals often perceive that removing an existing health technology is of greater disadvantage than refusing to embrace a new health technology of comparable value (13). Removing or changing existing technology or practise may not be favorable since trained doctors view technology as an integral element of their job (3;13;25). For fear of being questioned by patients, some healthcare workers are reluctant to discontinue legacy therapies, such as older drugs, which have never been evaluated for cost-effectiveness (25). The assumption that disinvestment reduces prescriber and patient choice, and by reducing patient subsidies is also a main motivation for refusal (24).

Technical/Scientific Barriers

It is vital to convince stakeholders that withdrawing the technology would be harmless and that keeping it would be counterproductive (13). In some circumstances, the absence of robust evidence to support withdrawal decisions hinder the acceptance of disinvestment (7). A joint NICE-Cochrane pilot project found that specific review methods such as Cochrane systematic reviews were more likely to establish an absence of evidence rather than evidence of a lack of efficacy or effectiveness (23).

Technical challenges include variation in selecting and prioritizing health technologies for disinvestment (21). Failure to translate the suggested recommendations into binding guidelines and link them to adjustment in coverage decisions may result in stakeholder dissatisfaction (14).

Organizational Barriers

Stakeholders frequently lack the political, administrative, and clinical will to support disinvestment initiatives (11). Therefore, there is often a reluctance to devote appropriate resources to disinvestment programmes, such as educating specialists and HTA reviewers, providing incentives for implementation, and financing for related research to cover information and data shortages (11;16). Hence, having enough resources to support disinvestment programs is critical to ensure its sustainability (3).

Among the solutions proposed are the provision of international platforms for collaboration and development of transparent, adaptable disinvestment models, which can be achieved through multistakeholder engagement (11). Furthermore, the presence of strong leadership may also expedite acceptance and facilitate implementation by emphasizing the need of constructive disinvestment activities through better resource allocation (14).

Discussion

Disinvestment is a complex process of decision making influenced by systemic linkages between value-based spending, resource reallocation and quality of healthcare delivery. Despite the favorable outcomes behind the ideas, in practice, the process seems to be notoriously challenging in terms of scientific, political and ethical aspects (2). Our scoping review aimed to summarize the findings of a growing body of evidence on healthcare disinvestment. We undertook a comprehensive systematic search of disinvestment initiatives globally using a broad lexicon of terms to identify all relevant programs on disinvestment including HTR and assessment of low-value technologies.

In England in the UK, disinvestment initiatives have been carried out implicitly through NICE's current projects, with various outputs available on its Web site (28). The established processes employed by NICE are conducted through technology appraisals, recommendation reminders, and commissioning guidelines for clinical practice. The procedures are comparable to those used in its HTA projects for investment and reimbursement, in which a systematic and thorough approach to evidence appraisal, as well as multistakeholder participation, is required to reach a conclusion on

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technology disinvestment (29). Because HTR activities are carried out alongside other existing initiatives, there is no specific disinvestment framework or process formally created by NICE. Although frequently cited in the included reviews, the "Do Not Do" database had been removed from the NICE Web site in November 2017 (NICE Communications Coordinator of Enquiries, pers. commun., 16 Aug 2021) and any recommendations that were potentially cost saving have since been assessed using the cost saving and resource planning guidance under NICE activities (30).

The current plethora of terms and concepts in describing this process creates substantial confusion. Indirectly, it may influence stakeholders' engagement as well as the acceptance of the initiative, hence, a more neutral term such as HTR has been proposed to improve understanding (11;16;21). Whilst there are arguments raised by researchers on making a distinction between disinvestment and HTR, we believe that the differences are very subtle with some overlapping concepts, and it does not change the rationale of disinvestment. However, it is noteworthy that this process does not happen in a vacuum. Those involved in disinvestment are always aware of costs, even if cost reduction or reallocation of funds is not the primary motivation. Although they do not consider themselves to be rationing, HTR followed by disinvestment coupled with resource reallocation can appear very similar to rationing.

Analyzing the spectrum of disinvestment activities, stakeholder involvement would appear to be one of the most important aspects that needs to be addressed, allowing for higher acceptability, applicability, comprehension and political will. Early and continued stakeholder participation throughout the HTR activity, transparency in methodologies and processes, and ongoing knowledge transfer can all help to foster meaningful engagement (22). This is pivotal given their involvement in the provision of care and to avoid misperception in the purpose and process of disinvestment (25).

Barriers and challenges involving stakeholders' engagement are particularly profound during the implementation phase. Disinvestment efforts that lack of support from top level can lead to disengagement among frontline stakeholders tasked with implementation, particularly when the program's resources are limited (22). Some ideas for improving active engagement from these key stakeholders include incentivizing them to conduct more research to fill data gaps and contextualize critical data for reassessment purposes (11). In this instance, short-term resource allocation for disinvestment efforts is almost always unavoidable in order to realize long-term efficiency improvements (14).

Even though PBMA and standard HTA processes have been identified as the most used methods from our findings, there are differing views on their use in the context of disinvestment and resource reallocation. PBMA has had some difficulties in achieving disinvestment choices, and the outcomes in terms of permitting resource release are not always satisfactory (31). On the other hand, HTA was established with reimbursement rather than disinvestment in mind, as it is a valuable instrument for generating evidence in decision making and not a specially designed framework for disinvestment (32). There is a need to revisit disinvestment methods to capture policy-beneficial outputs beyond or within PBMA and HTA, particularly in terms of technical analysis and what constitutes acceptable evidence. Common methods which can be applied within both these frameworks include the use of economic evaluation and multicriteria decision analysis (MCDA). Furthermore, the growing importance of real-world evidence in the context of disinvestment may be highlighted more explicitly to accelerate and broaden its use in disinvestment.

A robust HTR, on the other hand, is part of the trajectory of health technology management, which also includes continues reassessment of technologies for improved health care. Future research could shift the emphasis away from disinvesting, and more on the appropriateness and scope of technology utilization, including resource reallocation to technologies with higher value to the patients.

Strengths and Limitations of This Scoping Review

The comprehensive search strategy and thorough analysis of the literature on this topic are the key strengths of this scoping review. Due to substantial number of publications in this area, we focused on synthesizing the evidence from the existing reviews to systematically summarize their findings in issues related to disinvestment. We covered aspects on clarifying the concepts, the methods and processes of disinvestment, the types of evidence used in the evaluations, and stakeholder involvement in the implementation of disinvestment initiatives. Other studies have tended to focus only on specific aspects of disinvestment in healthcare, such as the identification and prioritization processes (21), initiatives in specific regions, countries or within HTA agencies (13;17;18), and specific health technologies such as pharmaceuticals (11;24) or nonpharmaceuticals only (16;25). This review also highlighted the facilitators and barriers in disinvestment, which we consider as critical components in implementing the initiatives.

We also acknowledge some limitations in this review. Most of the included publications only discussed disinvestment initiatives in high-income countries. It is possible that we overlooked unpublished, informal, or small-scale initiatives in low-and-middle-income countries, which equally grapple with resource reallocation and value-based healthcare spending. Furthermore, small studies on disinvestment from regional areas may be classified or published as quality improvement and thus escape the scope of this review. Another limitation in this review is the lack of details on additional dimensions of using HTA in disinvestment process as it is not well-expanded in the included articles. We also recognize that there is limited information on the impacts of the proposed initiatives reported in the included articles. These can be improved by focusing the research on a specific disinvestment program or agency that has already implemented disinvestment initiatives, which could be conducted through case studies on the evaluation and monitoring of related policy.

Conclusion

With the growing emphasis for transparent and systematic processes of resource allocation, disinvestment initiatives have been a priority in countries and agencies worldwide despite the complexity of its implementation. There are plethora of terms and concepts in disinvestment in healthcare, but the purposes are consistent—toward value-based decision making and wise spending of resources to achieve maximum benefits for population health and improvement in the quality of care. Disinvestment programs have been implemented at various levels in many countries, but the success of these initiatives has been mixed. This scoping review also highlights the critical role of stakeholder involvement in disinvestment. The most used tools for assessing

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candidates for disinvestment are PBMA and HTA; nevertheless, there is a lack of clarity on the additional dimensions of technical analysis related to these tools. Further research could focus on technology optimization in healthcare, which includes continuous reassessment of health technologies as part of overall health technology management and resource reallocation to higher value technologies.

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