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A Systematised Review of Policy Responses to Supplier-Induced Demand

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ABSTRACT

Health systems around the world contend with cost containment. As a result, policymakers pay attention to how the use of health services drives health expenditure. The rate of use of health services can increase due to additional demand generated by healthcare providers. Currently, however, research on policy interventions used to address demand created by providers is limited. This paper therefore contributes to the literature by conducting a systematised review of common themes found in the literature on additional demand generated by healthcare providers, known as supplier-induced demand, and the associated policy interventions. Building on 33 papers identified in a 2019 scoping review by Mohammadshahi et al., a systematic search added 86 papers from PubMed and 134 from Scopus. After screening and applying inclusion and exclusion criteria, 11 articles were reviewed. This review identified four key themes in the research on supplier-induced demand: Competition, incentives, and responses to health reform, and responses to reimbursement changes. In addition, the study finds the focus areas of policy responses to supplier-induced demand to be the following: Provider payment methods, capacity management, stricter regulation and monitoring of adherence to clinical guidelines, increased reviews by insurers, and health promotion to patients. To allocate resources efficiently and equitably, health system leaders should strengthen the monitoring and evaluation of unintended consequences which stem from expanding access to health services.

Keywords: supplier-induced demand, physician-induced demand, provider payment systems, healthcare utilisation

INTRODUCTION

Health economics focuses on how to provide healthcare in a way that is fair, affordable, and accessible. Understanding where and how to allocate limited funds and resources requires understanding a population's usage patterns for health services. Healthcare providers heavily influence this usage, and they have a better understanding of patients' conditions compared to patients themselves. Healthcare utilisation is also influenced by an individual's or household's decision to seek care, and whether services are accessible when needed. In health economics, healthcare utilisation is considered to be on a spectrum: It can range from necessary to unnecessary, and can range from too high to too low.

Low utilisation rates of health services may suggest health services are not accessible to all. It can also mean that the available services are being used by those who need them most, and there is a low level of wasteful use of healthcare services. Following this logic, high utilisation rates can suggest good access to health services. It may also indicate that there is overuse of services, such as doctors prescribing diagnostic tests with little clinical benefit, or surgeons providing surgeries for conditions that could be managed conservatively. This review does not focus on evaluating the appropriate level of healthcare use. Instead, this review examines a key factor that influences utilisation and is an important factor when deciding how to allocate resources: supplier-induced demand for healthcare.

Two terms that are sometimes used interchangeably in the literature are 'supplier-induced demand' (SID) and 'physician-induced demand' (PID). Supplier-induced demand refers broadly to any provider – a hospital, a diagnostic lab, or a general practitioner – increasing a patient's demand for health services in a way that is not in the patient's best interests (Amporfu, 2011) or provides little clinical benefit. Physician-induced demand is the same concept, but refers specifically to a doctor. Supplier-induced demand encompasses broad systemic factors, while physician-induced demand focuses on doctors' behaviors. For the purpose of this review, 'supplier-induced demand' or 'SID' is used to reflect the broad scope of healthcare professionals across specialties and health systems.

There is asymmetry of information in the interaction between a health practitioner and a patient. This information asymmetry creates a principal-agent problem that is inherent in healthcare: Healthcare providers, acting as imperfect agents of patients, may prioritise maximising their

profits (Nguyen, 2011). When supplier-induced demand is observed, the provider influences the quantity of healthcare services beyond what is clinically necessary in order to align the patient's demand to the provider's own interests (Johnson, 2014). Since health economics is concerned with equitable and efficient allocation of resources in healthcare, supplier-induced demand is one of the most frequently researched topics in this field. Determining whether health services are underused or overused requires deciding on the appropriate amount of care use. These kinds of evaluations are time- and resource-intensive (de Graaf-Ruizendaal et al., 2018). This study's scope is limited to situations where use of healthcare services is considered high.

In developed, well-resourced regions with national health insurance, healthcare utilisation rates may grow due to an increasing number of insured individuals. Since people are more likely to seek healthcare once they are insured (Bailey, 2021), increase use of services is not surprising. Health insurance explicitly enables an individual to use healthcare services which will be reimbursed (Ataguba and Goudge, 2012). However, increased use of health services should reflect the additional need for care.

In developing countries, where a greater share healthcare can be out-of-pocket, healthcare utilisation tends to be heavily influenced by an individual's (or household's) ability to pay. Paying for health services can lead to heavy financial burden, and can have devastating financial consequences for people and households (Qosaj et al., 2018). While high-income and developed regions' health systems are predominantly financed through taxes to achieve universal coverage, developing countries use different strategies. One example is the implementation of prepayment mechanisms and micro-insurance, such as community-based health insurance (CBHI). This type of health insurance is voluntary, and targets low-income populations, rural areas, and underserved communities. Members contribute to a pooled fund. This pool of funds is used for the medical expenses of community members when needed (Habte et al., 2022).

Supplier-induced demand has received much attention since Roemer (1961) famously stated what is now known in health policy as Roemer's Law: "In an insured population, a hospital bed built is a bed filled" (Roemer, 1961). There are, however, suggestions in the literature about a lack of consensus on the research on supplier-induced demand (Léonard et al., 2009). Auster and Oaxaca (1981) criticise empirical studies of supplier-induced demand, by arguing that including the supply of health services (such as the number of doctors) in the demand equation makes it difficult to identify the true relationship between demand and supply because they

influence each other. Regions with more health services may have higher utilisation rates, however the causal relationship is unclear. The authors also suggest that "if suppliers can influence demand, there must exist limits on their ability to do so" (Auster, R. and Oaxaca, R.L., 1981). There is also high heterogeneity in the outcomes studied in the literature on SID. These outcomes range from economic impact to patient health (Léonard et al., 2009). This heterogeneity makes it difficult to generalise findings. Labelle et al. (1993) put forward that the literature has not consistently defined supplier-induced demand. These authors (Labelle et al., 1993) also believe that the literature has failed to address *how* supplier induced demand affects patients' health and health system outcomes. Labelle et al. (1993) also suggest that there is a lack of concern for the implications of the increased utilisation of services that is a result of SID. These authors (Labelle et al. 1993) present a perspective on supplier-induced demand on which this systematised review is based: That a focus primarily on the inducement alone is too limited for policy implications, and that there are several drivers of supplier-induced demand, with specific policy or intervention implications.

The aim of this systematised review is to investigate the key themes in the literature on supplier-induced demand (SID) and explore the described interventions or policy responses aimed at mitigating this phenomenon. The review identifies and extracts the main themes associated with SID, and summarises common policy responses to SID. The study offers insights for navigating the complexities of SID, particularly within healthcare systems undergoing reform or expansion.

METHODS

At the time of composing this paper, no comprehensive examination - in English - focusing on the policy measures or interventions described in supplier-induced demand (SID) research was found. Recognising this gap, this review seeks to fill this void in the literature through a systematised review. Reviews advance scholarly discourse by consolidating information and offering deeper insights into specific topics or research domains (Sataloff et al., 2021). Furthermore, reviews provide an organised assessment of a subject and lay the groundwork for further investigation (Jackson et al., 2021). A *systematic* review comprises of five steps: Framing questions for review, identifying relevant work, assessing the quality of studies, summarising the evidence, and interpreting the findings. A *systematised* review encompasses the fundamental components of a systematic review, but does not extend to the exhaustive depth of a full systematic review (Grant and Booth, 2009). Due to constraints in time and in resources, this review does assess the quality of the studies, and is therefore a systematised review.

This systematised review is based on the list of 33 studies reviewed by Mohammadshahi et al. (2019) in their scoping review of the components of supplier-induced demand. The authors carried out a scoping review in order to develop a conceptual framework for physician-induced demand (Mohammadshahi et al., 2019). In their initial search, the authors found 2154 articles. After reviewing the titles of these papers, based on the inclusion and exclusion criteria, Mohammadshahi et al. (2019) omitted studies that were duplicates, irrelevant, not published in English, or fell outside of the selected time period. To be eligible for review, a paper needed to include an identification of specific components of SID, as well as the metrics used to measure relationships between these components. The authors (Mohammadshahi et al., 2019) ultimately reviewed 33 studies published between January 1980 and January 2017. This systematised review uses that list of studies included in Mohammadshahi et al. (2019), and applies exclusion and inclusion criteria in order to review a subset of the papers.

In addition, in order to include research published after Mohammadshahi et al. (2019), this review conducts a search of relevant research from 2017 to 2022. Inclusion and exclusion criteria are thereafter applied (Table 1). The process is described below.

Step 1: Identifying the initial research questions

The review has three guiding questions:

1. What are the key themes that emerge in the research on supplier-induced demand?
2. Are there policy responses that the research identifies or recommends?
3. Based on the themes that typically emerge, and policy responses, what are the key considerations for policymakers?

Step 2: Search strategy

This review sought to review the 33 papers reviewed in Mohammadshahi et al. (2019), and carry out an additional search of relevant papers published between 2017 and 2022. Due to the constraints of resources needed for a full systematic review, PubMed and Scopus are the only databases used in the search of papers published from 2017 until 2022.

Stage 1: Study identification on selected databases

An electronic literature search was conducted on the PubMed and Scopus databases using the Boolean operators indicated in Table 1.

Table 1. Search criteria used on PubMed and Scopus

Database	Boolean operator
PubMed	(((((Supplier induced demand [Title/Abstract]) OR Physician induced demand [Title/Abstract]) OR PID [Title/Abstract]) OR SID [Title/Abstract])) AND policy [Title/Abstract]
Scopus	(TITLE-ABS-KEY (physician AND induced AND demand) OR TITLE-ABS-KEY (supplier AND induced AND demand) OR TITLE-ABS-KEY (PID) OR TITLE-ABS-KEY (SID) AND TITLE-ABS-KEY (payment) OR TITLE-ABS-KEY (insurance) OR TITLE-ABS-KEY (physician AND density) OR TITLE-ABS-KEY (service AND price) OR TITLE-ABS-KEY (asymmetric AND information) AND LANGUAGE (English)) AND PUBYEAR > 2016 AND PUBYEAR < 2023

Stage 2: Eligibility based on study abstracts

The next stage of the study selection focused on ensuring only appropriate research papers were included in the review by way of reviewing the titles and abstracts of the results.

Stage 3: Applying inclusion and exclusion criteria

Upon assessing the list of studies it became evident that the list of papers included multiple types of research papers, including theoretical papers and conceptual frameworks. This required further refining the list of studies to only include observational and interventional studies.

Inclusion criteria:

1. Study design: Observational (cross-sectional, case control, and cohort), or interventional (randomised controlled trials or quasi-experimental) study designs

Exclusion criteria:

1. Study design is not empirical (e.g. case reports, poster abstracts, reviews, theoretical frameworks, and unpublished theses or dissertation research
2. Article is published in languages other than English

Stage 4: Relevance to the research question

Finally, a last step was applied to ensure that the research papers included did not only adequately address the topic of physician- and supplier-induced demand by finding or showing evidence of induced demand, but also addressed the research question.

Step 3: Data charting and collation

A worksheet was created in Excel for the studies identified at each stage. This worksheet detailed for each paper, in tabular format, the following: Author(s), year published, title, the relevant geography, the healthcare setting, background to the study, the methodology and findings, and policy responses or recommendations for addressing supplier-induced demand.

Step 4: Summary and reporting of findings

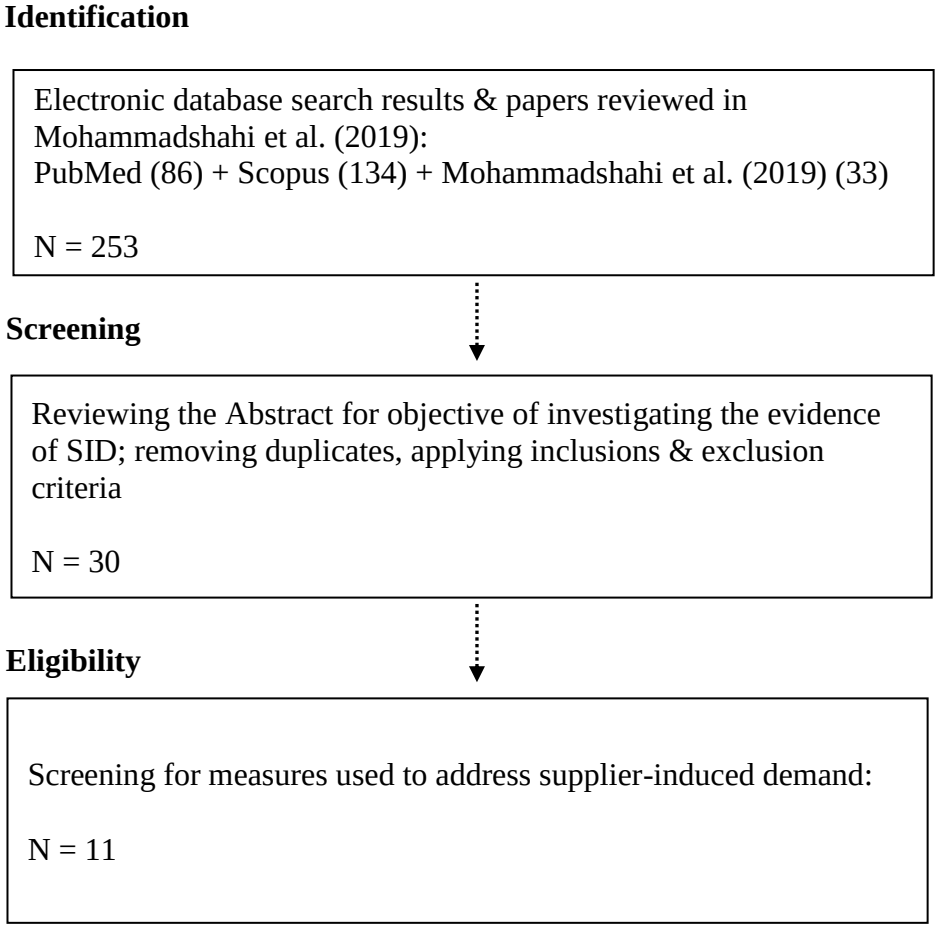
The review findings are presented in a narrative synthesis to capture the themes that emerge in the research and policy responses to supplier-induced demand in healthcare.

RESULTS

Based on the Boolean operators used, PubMed returned 86 free full text results, whilst Scopus returned 134 papers. The titles and abstracts of each of the 86 papers from PubMed were reviewed closely to identify studies focused on investigating evidence of induced demand. Of the 86 initial search results from PubMed, 1 study was eligible. An initial screening of the list of papers reviewed by Mohammadshahi et al. (2019) resulted in 23 of the 33 papers being eligible. From Scopus, 6 eligible papers remained.

Of the 30 papers, 19 were excluded as the study did not include any exploration or description of policy responses or other interventions for addressing or eliminating supplier-induced demand. Finally, 11 papers were eligible for inclusion in the systematised review. The search strategy, screening outcomes, and application of inclusion and exclusion criteria is illustrated in Figure 1.

Figure 1. Summary of study selection



The studies reviewed show the characteristics that are described by Labelle et al. (1994): Most of the research on SID focuses on the inducement of demand alone. Specifically, the research tends to focus mainly on finding evidence of supplier-induced demand. The results show that researchers use specific clinical or health system settings to measure utilisation rates or to identify changes in utilisation rates that can be explained by supplier-induced demand. As a result, most of the research cannot be generalised. Most of the studies only have a light-touch mention of policy responses and interventions to mitigate or address supplier-induced demand.

The results also show that the research on supplier-induced demand is highly heterogeneous in geographical focus. Two studies are based in Ghana (Amporfu, 2011; Dzampe & Takahashi 2022), two studies are based in China (Zhou et al., 2021; Yu et al., 2020), two studies are in Iran (Alinia et al., 2021; Akbari et al., 2022), and the remaining five studies are from countries across Asia and Europe. This heterogeneity of the geographical areas of focus in the research shows that supplier-induced demand can occur in both developing countries and developed countries. The findings suggest that in developing countries, inducement of demand for health services is found in the private health sector. In developing countries, the research focuses on supplier-induced demand where there is a large public sector payer.

Two studies explored evidence of SID in diagnostic testing, specifically: Imaging diagnostics for oncology in Iran (Akbari et al., 2022), and imaging diagnostics in an ambulance and inpatient department in tertiary hospital settings in Switzerland (Zabrodina et al., 2020). This might indicate that diagnostics in any patient journey almost naturally lends itself to providers inducing demand for services. Given the complexity of diagnostic testing, the relevant expertise regarding the best test to use sits almost entirely with a health provider. A provider, for example, will know the biomarkers to evaluate in patient. Similarly, a health practitioner, through skills gained from years of education and practice, may already have a hypothesis that they need to confirmation through tests. However, a doctor might request or suggest further diagnostic tests or procedures simply to rule out conditions. This additional testing might provide very little additional insight or clinical benefit, especially to the patient.

The results of the review also show heterogeneity in the methods and data used to find evidence of supplier-induced demand. The datasets used in the studies range from panel data to cross-sectional data, to data that is entirely qualitative (patient questionnaire responses). As described by Léonard et al (2009), there is a heterogenous variety of dependent variables that are used as

measures indicating evidence of supplier-induced demand. Examples include: physician earnings, number of rejected insurance claims, and number of visits to a hospital. The outcomes measured in each paper are listed in Table 2.

A predominant feature in the list of eligible studies reviewed is that SID is measured using volumes of consultations, procedures or diagnostic tests which are considered high, or increase over time. Where the researcher find that systemic factors or changes in disease burden does not explain the observed increases in utilisation rates, it is suggested that supplier induced demand exists.

Table 2. Outcomes measured in the papers included in the review

Reference	Outcome variable
Redeker et al., 2022	Number of procedures, number of inpatient dialysis
Amporfu, 2011	Number of hospital visits
Xirasagar et al., 2006	Physician earnings
Yuda, 2013	Number of rejected insurance claims
Grytten et al., 2001	Number of consultations, revenue from itemised treatment items during consultations
Zabrodina et al., 2020	Ratio of revenue
Dzampe and Takahashi, 2022	Number of consultations
Zhou et al., 2021	Spend on patients, diagnostics and medication
Yu et al., 2020	Medical expenses of insurers
Alinia et al., 2021	Number of surgeries
Akbari et al., 2022	Eligibility for ultrasonography

The results also show that health systems with a large single payer are a frequent feature in the literature. Since increases in utilisation are a driver in increased health expenditure, supplier-induced demand is of particular interest for universal health coverage and national health insurance. The reviewed papers address this in China (Zhou et al., 2021), Ghana (Amporfu, 2001), Norway (Grytten et al., 2001), Switzerland (Zabrodina, 2020), and Taiwan (Xirasagar, 2006).

The results also show that supplier-induced demand is studied in many different healthcare settings (such as in-patient dialysis centres (Redeker et al., 2022) and private hospitals (Amporfu, 2011). Similarly, the research cuts across different levels of care ranging from primary care services, to tertiary care such as in-patient hospital departments.

Regardless of differences in geographical settings, medical specialties and measures of supplier-induced demand, evidence of supplier-induced demand was found in all but one paper (Grytten et al., 2001). Table 3 provides a summary.

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Amporfu (2011)	Ghana	Private hospitals	Members of the National Health Insurance Scheme (NHIS) in Ghana do not incur costs at the point of care. Patients choose their own providers, however this led to over-crowding in public facilities. As a result, private health facilities were accredited by the NHIS to reduce over-crowding in public health facilities. Providers in public facilities receive a salary, however in private hospitals, providers are paid by the NHIS using a fee-for-service system. The paper tests for supplier-induced demand among patients who received care in private, for profit, hospitals with NHIS accreditation.	The study compares the demand curves for health care by insured outpatients in public facilities to the demand curves of insured patients in accredited private hospitals. The authors describe a 'psychic cost of inducement': Physicians are less likely to induce care if it imposes high direct cost on patients. This provides an explanation for using data on insured individuals to investigate the presence of SID.	The number of visits for patients between the ages of 18 and 60 in private hospitals was higher than public facilities.	The study recommends changing the payment scheme used for accredited private hospitals by the NHIS from fee for service to prospective payment, or a combination of both. Prospective payment refers to capital or budget allocation. This would may lead to efficient utilisation of health services when prospective payment is combined with fee for service.

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Redeker et al. (2022)	Netherlands	Dialysis centres	Patients with end-stage kidney disease (ESKD) can be treated with kidney replacement therapy in the form of dialysis, or a transplant from a deceased or living donor. Transplant is has lower cost to society with better quality of life and survival outcomes. The authors argue there is over-utilisation of in-center dialysis and current policy leads to excessive spend and suboptimal care for individuals with ESKD	The authors explored international research on the utilisation rates of kidney replacement therapies in countries with a developed healthcare system. Publicly available records from the Dutch Renal Registry were used.	The results showed a decline in the number of patients undergoing home dialysis, with no evidence of changes in financing or the production and delivery of home dialysis for the same period. This suggests that patients were being redirected to in-patient treatment as a means of preventing empty beds.	Capacity reduction of in-center beds Eliminating financial disincentives of empty in-center dialysis beds Increasing the capacity of transplant facilities Incentivise preemptive transplants and home dialysis. Remove disincentives of empty in-center beds. Developing payment systems for physicians in such a way that medical decisions are less affected by compensation

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Xirasagar & Lin (2006)	Taiwan	Physician practices	Physicians in hospitals in Taiwan receive a salary, a bonus, volume-driven fees & income from teaching and research. Outpatient care is divided equally between outpatient departments and physicians in the hospital. For office-based physicians, visits are reimbursed by national insurance at a fixed rate per visit, and additional procedures are reimbursed using item-wise billing, which requires a considerable amount of paperwork. Office-based physicians refer their patients to other office-based specialists to avoid losing patients to hospitals. The authors assessed the earnings of 8106 office-based physicians with 2 hypotheses : (1) An increase in total physician density is positively associated with earnings due to SID (2) An increase in physician density is negatively associated with earnings, due to competition for patients.	The researchers examined the outpatient clams data for office-based doctors. Gross earnings was used as the dependent variable, and the main independent variables were specialty, level of intra-specialty competition and variables to capture healthcare demand. To test for SID and the effects of physician competition on earnings, 3 variables which represent competition level were used.	The results show that a physician earns less in more competitive markets for their specialty. Since patients in Taiwan prefer hospitals for procedure-oriented care, the supplier-induced demand in this setting is in the form of mutual cross-referral between office-based specialists who want to avoid losing patients to hospital settings.	The researchers describes that young people in Taiwan may continue to seek medical careers due to the high earning potential, particularly as a specialist. They recommend government regulating the number of newly-qualified specialists in specialties where a large decrease in earnings is observed if competition increases.

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Yuda (2013)	Japan	Multiple (all insurance claims)	In Japan, third-party payers assess the validity of medical treatments that are listed in the invoices from medical institutions. If they find evidence of medically unnecessary and/or excessive treatments, the outstanding medical fees are not reimbursed. This study examines whether negative income shocks to medical fees drive providers to supply unnecessary and/or excessive treatments.	The authors use as a variable the amount of fraudulent and/or incorrect claims detected during the bill inspection processes. A fixed-effects regression model is used to examine the effectives of negative income shocks on medical providers who induce demand for services.	1. Providers increase inducement by 7.5 percent in response to a 1 percent medical fee reduction without any changes to the supply of health providers 2. Providers in areas with competition are more sensitive to medical fee reductions. 3. Providers in low-density areas with less competition induce demand in a response to low patient volumes.	The authors describe that reducing the occurrences of SID leads to resources being more efficiently utilised, which leads to greater social welfare. They achieve this, they recommend the following to reduce SID: 1. Encouraging more medical institutions to digitise their medical information 2. Expanding the payment system to more health care service

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Grytten, et al. (2001)	Norway	Primary care (physicians)	Primary care in Norway is provided by community physicians (salaried municipal employees) and contracts physicians. Contract physicians are self-employed, and receive a municipal grant which provides 30% of their income. The rest comes from patient fees: Patients pay a fixed fee for the consultation (30% of the physician's income), and the physician is paid by the National Insurance Administration for providing treatment (this provides the remaining 40% of their income). The authors argue that if inducement exists, physicians with a low non-practice income who work in municipalities where competition for patients is high, compensate for lack of patients by inducing demand.	Data from the National Insurance Administration for one month in 1995 was obtained, and a regression analysis applied, with non-practice incomes as the dependent variable.	The results provide evidence against SID	The authors describe implications of their findings for public policy in Norway; Redistribution of primary care physicians is not justified on the basis of supplier-induced demand, but rather for other reasons such as meeting the demand for health services in regions where there is a low volume of physicians.

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Zabrodina et al. (2020)	Switzerland	Ambulances and inpatient care	In Switzerland reform of hospital financing meant that imaging examinations in the inpatient sector could no longer be charged separately. Fee for service reimbursement for imaging in ambulatory sector was unchanged. The reform altered the direct and indirect financial incentives faced by hospital imaging units, which have their own budgets within a hospital. Before the reform, hospital imaging units typically earned volume-based revenue for which they could bill directly. With the reform, inpatient imaging exams are a cost for the hospital rather than a direct source of revenue.	To measure SID, the authors use a particularity of the fee-for-service ambulatory reimbursement system that allows radiologists to claim reimbursement for self-referred repeat CT and MRI examinations, in addition to those requested by referring physicians. These tests are known as repeated imaging examinations (RIE). This additional test provides little to no benefit to the patient, but a high marginal return to the radiologist. The researchers use insurance claims data for 2009-2015: Using difference in differences, they compare differences in the RIE rates before and after the reform in the ambulatory sector of hospital-based imaging units (treated variable) and non-hospital imaging clinics (control).	The reform increased SID in hospital imaging.	Combine payment systems that link incentives across care sectors, for example, bundled payments and risk sharing contracts with integrated care providers responsible for all expenditures in the population

Table 3. Summary of papers reviewed

study	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Dzampe & Takahashi(2022)	Ghana	Primary care (doctors)	The goal of this study is to investigate whether PID exists in Ghana's healthcare system. Study examines whether physician-induced demand for hypertension disease care exists in Ghana's healthcare system where price is regulated, and there is no co-payment.	Authors use 36 months of panel data of administrative claims (2017-2019) and an instrumental variable method The use a method similar to other research in the literature: Examining the relationship between the district-level doctor-to-population ratio and the service provider level use of hypertension care, where a positive correlation is taken as supporting the existence of PID. Doctor-to-population ratio may be endogenous due to omitted factors such as average travel time or the general health knowledge of the population.	The results imply a positive associate between the doctor-to-population ratio and the number of visits, which support the hypothesis that PID exists. A 1% increase in the doctor to-population ratio is associated with a 0.35% increase in the number of visits, which is evidence of PID.	Incentivise health providers to locate themselves in areas with low doctor densities. Provisional licenses may only be granted to such health providers. For example, in England physician contracts includes financial and other incentives for physicians locating in deprived areas

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Zhou et al. (2021)	China	Public hospitals	In 2009, China launched a nationwide reform to overhaul its enormous healthcare system. Subsequently, government spending on healthcare increased significantly. Simultaneously, public hospitals experienced rapid expansion. This study empirically examines whether supply-induced demand existed for public hospitals during the expansion process, based on hospital longitudinal data from 2007 to 2016	The authors obtained hospital panel data from the Annual Report of Medical and Health Institutions in a major Chinese city for the period 2007–2016. The dataset was assembled by the National Health Commission and covered all hospitals in this city. The unit of observation was hospital by year. A model was established to investigate the changes in hospital behavior before and after rating.	Based on the evidence provided in this study, the expansion of public hospitals has resulted in a waste of healthcare resources and a rise in the healthcare burden on patients	Institutional reform of public hospitals is required to fundamentally solve the problem of incentives

Table 3. Summary of papers reviewed

REFERENCE	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Yu et al. (2020)	China	Public hospitals	This study estimates the expense of patients insured by different schemes to observe and test whether SID occurs and whether its degree differs significantly among the different schemes in China. The study focuses on the impact of information asymmetry	The data the authors use are from the electronic medical records of inpatients at a public Tier-three hospital in a city in Zhejiang Province in 2014. To estimate the impact of different insurance schemes, five dummy variables are introduced to represent patients insured by different insurance schemes. The reference category for the insurance variables is the patient who is insured by no insurance scheme. The dependent variable in the model is the natural logarithm of the total expenditure of all inpatients	Hypothesis 1: Changes in information asymmetry do not affect the total medical expenses in any insurance scheme. Hypothesis 2: To the extent that medical costs differ among patients in different schemes, these differences are not related to changes in information asymmetry. The reverse of Hypothesis 1 is observed. Except for one insurer, the authors observe a significant difference among the impacts of different insurance schemes on total medical expenses when the degree of information asymmetry changes. Hypothesis 2 is also partly disproved. In general, the evidence here points to the strong likelihood that a higher benefit level for a scheme is associated with a stronger impact on total medical expenses during a single hospitalisation.	Government stewardship of strategic purchasing that focuses on fair competition in insurance contracts and good governance of public hospitals

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Alinia et al. (2021)	Iran	Tertiary care (hospitals)	The existence of PID in the Iranian health system is very likely for structural reasons. Physicians have a very high degree of freedom of action in the Iranian health system, and regulatory bodies do not effectively monitor their performance. Reimbursement to the providers is in the form of Fee-For-Service and dramatically increases the motivation of providers to deliver more services. Also, the physician-population ratio has increased significantly over the past decade	This paper used an unbalanced individual panel data covering the steady-state 15,729 knee replacement surgeries (KRS) performed by 995 surgeons provided by the Armed Forces Insurance Organisation at the provincial level over the 60 months (2014–2018). Authors use a generalised method of moment's system (GMM-SYS) to obtain consistent and asymptotically efficient estimates, which provide a vital instrument for our dynamic panel data	A significant part of the increased demand for KSR services was due to SID	Policymakers can minimise this induced demand by setting stricter criteria for KRS licensing and requiring physicians to adhere to the relevant clinical guideline.

Table 3. Summary of papers reviewed

STUDY	COUNTRY	SETTING	BACKGROUND	METHODS	RESULTS	ADDRESSING SID
Akbari et al. (2022)	Iran	Cancer centres	This study aimed to investigate the extent of SID when performing a diagnostic ultrasonography (US) for primary breast cancer patients and its relationship with socioeconomic factors in Iran.	Data was obtained using questionnaires from 334 patients referred to the Cancer Research Center. A comprehensive index was created to screen those 'most probably affected by SID'.	Most of the ultrasonography was affected by SID. Cancer is complex. Therefore, information asymmetry is very high. This makes, the patient's demand for medical care rest with the physician. The patient's demand is almost entirely determined by the physician's demand.	This study showed that as the patient's educational level increases, the extent to which he/she is affected by SID decreases. The general population should, therefore, raise their information about healthcare services, especially cancer diagnostic imaging.

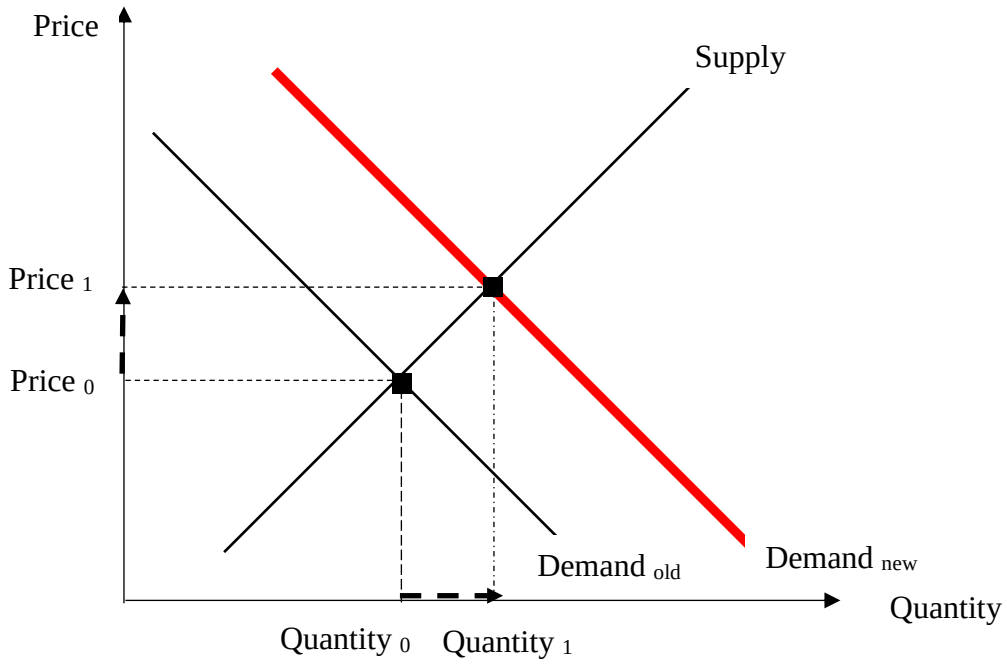
DISCUSSION

To the best of knowledge at the time of writing, this systematised review of supplier-induced demand is the first to review the policy responses designed to address inducement of demand for healthcare.

SID refers to a situation where the supplier of a healthcare service induces additional demand for that service, beyond what the patient would normally require (Johnson, 2014). When this occurs, the patient's demand for health services increases, which is indicated by a shift to the right of the patient's demand curve. This is illustrated in Figure 2.

As the patient's demand increases, the demand curve shifts to the right from $Demand_{old}$ to $Demand_{new}$, as shown in Figure 2. At the new equilibrium, there is a higher price of $Price_1$ and a higher quantity of services provided at $Quantity_1$. This diagram shows how supplier-induced demand for health services contributes to escalating healthcare prices globally (Jödicke et al., 2019 & Amporfu, 2011).

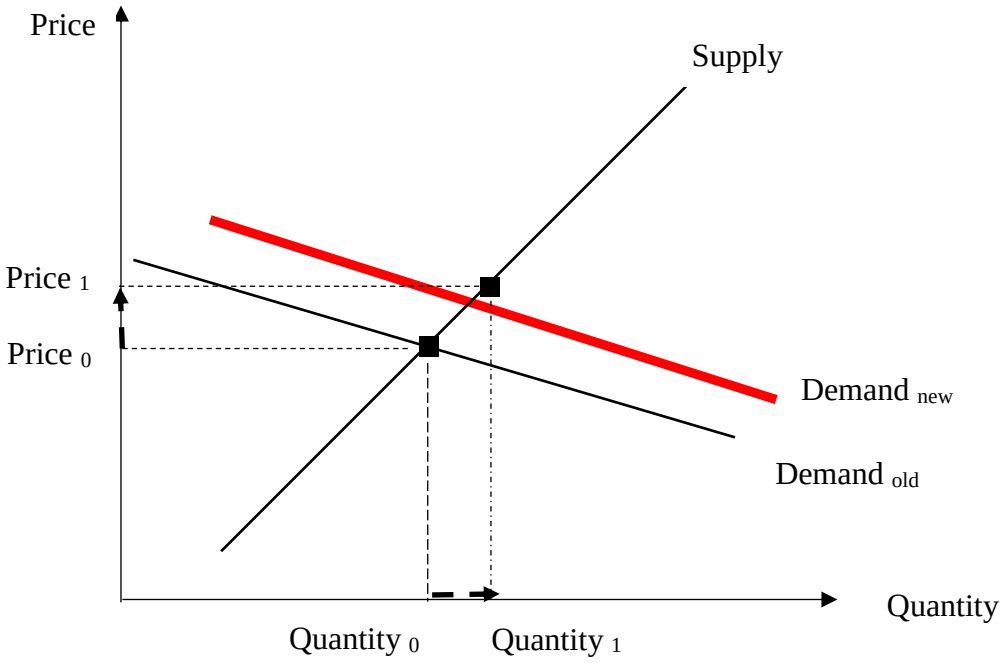
Figure 2. Graph showing a rightward shift of the patient demand curve



Source: Amporfu, 2011

Figure 3 provides an illustration which considers the peculiarities of elasticity. When patients are more responsive to a change in price, the demand curve is more elastic. The demand curve is therefore flatter, as seen in Figure 3. For health services that are elective, such as cosmetic procedures, the consumer's demand is more elastic. As a result, when the demand curve shifts rightwards ($Demand_{old}$ to $Demand_{new}$), there is still an increase in the equilibrium quantity of services, but this increase is smaller.

Figure 3. Graph showing a rightward shift of the patient demand curve for services that are more elastic



This systematised review pools the findings and policy responses to induced demand for health services from 11 studies. The review's findings provide evidence that there is a limited number of closely-related themes in the research on supplier-induced demand. In addition, the research delves into the structural aspects of health systems and services which create supplier-induced demand as an unintended consequence. It is these structural aspects that frequently emerge in the research which shape the key themes that emerge in the research. Equally important to note is the scarcity of research on supplier-induced demand which describes policies to mitigate or address supplier-induced demand. In the studies that formed part of this review, such policies or measures are included. In addition, policies and initiatives are highly specific to each study's setting, limiting the ability to generalise to. In general, studies tend to provide little to no discussion of effectiveness of policies and their relevance in comparable settings. This gap in

the research, posited by Labelle (1994), informed this systematised review, and informs the policy responses captured in this discussion of the findings.

Competition between healthcare providers

Physician density - the number of physicians relative to the population they serve within a specific geographic area – plays an important role in supplier-induced demand (SID) due to its impact on healthcare delivery, patient outcomes, and healthcare expenditure (Xirasagar et al., 2006). Many studies have examined how variations in physician density impact the likelihood, occurrence and extent of SID, revealing insights into the interplay between provider availability, competition, and healthcare utilisation. Within a given specialty, a physician earns less in more competitive markets (Xirasagar, 2006). Provider availability plays a pivotal role in determining patients' access to care by influencing geographical accessibility, appointment availability, healthcare facility accessibility, choice of providers, and healthcare disparities.

High physician density environments often have increased competition among providers, leading to efforts to attract and keep patients through various means, including inducement of unnecessary services or procedures (Amporfu, 2011; Xirasagar, 2006). Similarly, Xirasagar (2006) finds that areas with a higher physician density have more outpatient visits. This is particularly prominent where there is no co-payment by patients at the point of care, as Amporfu (2011) describes for Ghana. This phenomenon is particularly evident when using fee-for-service provider payment systems, where providers have an incentive to maximise service volume to protect their revenue streams (Amporfu, 2011). In regions with high physician density, providers may engage in aggressive marketing strategies, over-prescribing medications, or recommending unnecessary tests to attract patients and increase their market share. Moreover, in settings where physicians are compensated based on service volume, higher physician density exacerbates the financial incentive to induce demand, leading to over-utilisation of healthcare resources.

Low physician density also contributes to evidence of SID: Providers in regions where competition is low may face challenges in maintaining their patient volumes due to limited demand, leading them to induce care to fill their schedules and maintain their revenue and income. Additionally, patients in underserved areas may have fewer alternatives for healthcare, rendering them more susceptible to overtreatment or unnecessary interventions (Yuda, 2013).

Conversely, areas with low physician density provide an opportunity to improve health access by providing incentives for physicians to locate themselves areas that are under-served (Dzampe and Takahashi, 2022).

Competition refers not only to that between health professionals, yet may also occur as a result of expansion in infrastructure, and the resulting competition between medical facilities or practices. The findings of this review illustrate this in China (Zhou et al., 2021), where nationwide healthcare reform led to expansion and significant increases in healthcare expenditure. The number of hospitals of all tiers (primary, secondary and tertiary) grew significantly. The highest rate of growth was observed in tertiary hospitals. This expansion extended to the workforce, with major growth in the number of doctors. Ikegami et al. (2021) describe that SID may occur in facilities which procure new equipment, which may cause an increase in competition between local facilities. This leads to SID in surrounding health facilities due to attempts to compensate for loss of revenue.

It is critical to note that the relationship between physician density and SID is, however, not solely a result of competition due to proximity to other health practitioners. Provider characteristics, practice patterns, patient preferences, and regulatory frameworks play a significant role. Xirasagar (2006) describes that the youth may seek certain medical careers due to high earning potential, however this will increase competition. In response to this, the author recommends regulating the volume of newly-qualified practitioners entering a field where a significant decline in earnings occurs when competition occurs. This was practical difficulties and ethical implications. Furthermore, physician autonomy, and the level of monitoring of professional ethics influences the extent to which providers induce demand for health services. Research on physician density requires taking these factors in consideration when seeking to optimise healthcare delivery through efficient allocation of resourcing.

Healthcare provider decisions and incentives

The principal-agent problem in health economics describes providers as imperfect agents who act to maximise revenue (Nguyen, 2011). Since supplier-induced demand stems from a principal-agent problem, the majority of the published research on this topic focuses almost exclusively on describing the factors which drive the decisions and recommendations of healthcare providers. The papers in this review highlight the financial incentives and

disincentives in provider payment systems which lead to unintended consequence. Redeker et al. (2022) provide an example of this in their research on kidney replacement therapy in Netherlands, where evidence suggests a move away from the treatment options for end-stage kidney disease which provide better outcomes and quality of life for patients. Kidney replacement therapy (KRT) has two major categories: transplantation and dialysis. Between these two treatment options, transplantation has better outcomes for patients when compared to dialysis. Within dialysis, home dialysis provides better quality of life when compared to inpatient dialysis, which limits individual's movement and decreases life satisfaction due to frequently travelling to a facility where a significant amount of their time is spent undergoing dialysis. The investigation, however, uncovers a notable disparity in the Netherlands compared to other developed nations: A decline in home dialysis. This is despite the absence of changes in the financing, delivery, or production of home dialysis kits. This discrepancy suggests measures by providers to alleviate empty beds. Redeker et al. (2022) contend that this phenomenon is indicative of physician-induced demand driven by financial disincentives. This research indicates how incentives, or financial disincentives, impact provider behaviours and medical decisions.

In competitive settings, fee-for-service emerges as the provider payment mechanism most susceptible to supplier-induced demand (SID). This stems from the inherent nature of fee-for-service arrangements, where healthcare providers are remunerated based on the volume of services rendered rather than the outcomes achieved. Providers operating within fee-for-service frameworks may be incentivised to increase service provision to maximise financial returns, potentially leading to the over-utilisation of healthcare resources and the induction of unnecessary treatments (Redeker et al., 2022; Amporfu, 2011). Designing alternative payment models, such as capitation or bundled payments, may serve to reduce the influence of financial incentives on medical decision-making processes. These payment systems characterised by fixed or predetermined payments per patient or episode of care, incentivise providers to deliver efficient and cost-effective care while mitigating the potential for supplier-induced demand. Moving forward, policymakers and healthcare stakeholders must remain vigilant in designing and implementing provider payment systems that prioritise value-based care delivery while mitigating the potential for supplier-induced demand to ensure the efficient and equitable allocation of healthcare resources.

Provider response to health reform

The literature in this review discusses provider behaviour and changes in utilisation which are a direct response to reform measures that are aimed at improving accessibility, affordability and efficiency of health services, such as regulating and reducing reimbursable medical fees (Yuda, 2013). Reform efforts may involve measures such as extending health insurance coverage, reducing financial barriers to care (Amporfu, 2011; Zabrodina, 2020), and improving healthcare infrastructure or increasing the availability of services (Zhou et al., 2021). This expanded access can result in more opportunities for healthcare providers to deliver services. Providers may be motivated to induce demand by recommending more services or procedures to patients, even if they are not strictly necessary.

Government expansion may coincide with investments in healthcare infrastructure and technology, such as medical equipment or diagnostic tools. While these advancements can improve patient care and outcomes, they can also create incentives for providers to utilise these technologies excessively to generate additional revenue (Yuda, 2013). Rapid government expansion can outpace regulatory oversight. When governments rapidly expand their roles or services, such as in healthcare, regulatory frameworks may struggle to keep pace with the scale and complexity of the expansion. This can occur due to limited resources, bureaucratic inefficiencies, and challenges in adapting regulations to new circumstances. Additionally, political pressures or competing priorities may divert attention away from regulatory oversight, leading to challenges in monitoring and controlling healthcare utilisation. In such instances, providers may exploit gaps in regulation and monitoring to engage in practices that increase service volume and revenue, even if they are not in the best interest of patient care. Lack of robust regulatory mechanisms to deter inappropriate utilisation can exacerbate SID by allowing providers to act with impunity.

Health reform may lead to more individuals seeking healthcare services, including those who may not have previously utilised healthcare due to financial constraints. Expansion measures such as investing in infrastructure, workforce development, and technology may improve the population’s perception of the quality of healthcare services. As a result, the population may feel more confident in the healthcare system's ability to meet their needs, leading them to seek preventive care, screenings, and treatments. With increased patient demand, providers may feel pressured to meet patients' expectations for care, which could include unnecessary tests, treatments, or referrals. Additionally, health reform initiatives often focus on promoting public

awareness and education about healthcare services and preventive measures. This increased awareness can empower individuals to take charge of their health and seek care when needed. While increasing health expenditure and expanding infrastructure are important aspects of healthcare improvement, true reform involves broader systemic changes that address underlying issues and inefficiencies in the healthcare system.

Changes to reimbursement

Reimbursement systems play a crucial role in influencing provider behaviour and inducing demand for services. Zabrodina (2020) describes how the reform of hospital financing in Switzerland meant that imaging changed from being billed by hospitals (and received as a direct source of revenue) to becoming a cost. Numerous investigations delve deeply into the relationship between physician behavior, financial incentives, and regulatory frameworks within healthcare systems. Madden et al. (2005) found Irish general practitioners' behaviour changed following a change in their financial incentives from fee-for-service to capitation. Similarly, Shigeoka and Fushimi (2014) describe evidence that neonatal intensive care utilisation grew after the introduction of partial prospective payment made the unit became more profitable. As healthcare costs continue to rise globally, cost containment measures are implemented to alleviate the strain on healthcare systems, governments and individuals. Two forms of cost containment are regulating the prices charged by practitioners, or making changes to reimbursement structures. When reimbursement fees are reduced, healthcare providers may experience a decrease in revenue for each service provided. To maintain or increase their income, providers may respond by increasing the volume of services they deliver. This can lead to the over-utilisation of healthcare services, as providers seek to offset the revenue loss caused by lower reimbursement rates by seeing more patients or ordering more tests and procedures. Providers may induce demand for services that may not be medically necessary in order to compensate for reduced reimbursement. This behaviour can be driven by financial incentives rather than considerations of patient need or best clinical practice. Induced demand for contributes to increased utilisation and increased expenditure, straining healthcare budgets further.

Regarding policy responses that the research identifies or recommends, a set of policy focus areas aimed at addressing induced demand for health services are included in this review: Capacity management that aligns supply with patient needs, Provider payment methods with

appropriate economic incentive mechanisms, Stricter regulation and monitoring of physicians' adherence to clinical guidelines, and healthcare promotion.

Capacity management that aligns supply with patient needs

Capacity management plays a crucial role in reducing supplier-induced demand (SID) by regulating the supply of healthcare services to align with actual patient needs. It involves strategically controlling the availability of healthcare resources such as hospital beds, medical equipment, and personnel to prevent overuse and unnecessary medical interventions driven by financial incentives. Redeker et al. (2022) describe limiting the capacity of in-centre beds for dialysis will ensure more patients with end-stage kidney disease are re-directed to the alternative treatment options, transplant and home dialysis, which provide better quality of life for patients and lower cost to the health system. When providers have excess capacity, such as empty dialysis beds, there is a temptation to fill them with patients, even when alternative and potentially more cost-effective treatments like home dialysis or kidney transplantation may be more suitable. Elek et al. (2015) describe the role of capacity in their assessment of the expansion of outpatient hospital facilities, finding that increasing the capacity raises the possibility of supplier-induced demand. Capacity management also involves increasing the availability of certain services or treatments that offer greater clinical benefit or cost-effectiveness. For kidney replacement therapy in the Netherlands, Redeker et al. (2022) suggest increasing the capacity of kidney transplant facilities. Capacity management helps ensure that healthcare resources are used efficiently and that patients receive the most appropriate care based on their clinical needs rather than financial considerations.

The use of Certificate of Need in the United States is an example of capacity management that is used today. Used in several states, it is a regulatory mechanism for approval of large capital expenditure for constructing new healthcare facilities. Delamater et al. (2013) describe that Roemer's Law ('a hospital bed built is a hospital bed used') is a justification for Certificate of Need Programs used in the United States. CON programs are independent entities which regulate the supply of health services to ensure two things: The population's demand for health is met, and there is no oversupply of services (Delamater et al., 2013). A hospital or health system is required to demonstrate community need before establishing or expanding a facility or service. This mechanism has been criticised as being more useful at protecting existing providers from competition than it is at protecting people and households from unnecessary

costs. A second criticism is that it tries to assign objective value to a subjective assessment of how valuable a facility is to the community.

Provider payment methods with appropriate economic incentive mechanisms

Provider payment methods play a crucial role in shaping the behaviour of healthcare providers and influencing the delivery of healthcare services. Payment mechanisms can incentivise certain practices, procedures, and behaviors among providers Changes to provider payment systems change the financial incentives that influence health practitioners' behaviour. By aligning payment incentives with desired clinical outcomes and cost-effectiveness, changes to provider payment systems can help mitigate the phenomenon of SID and promote more appropriate and efficient use of healthcare resources. This review contained several examples of the role of provider payment systems in driving overuse of health services.

Where the system relies solely on fee-for-service, faced with competition or low regulated prices, the literature suggests that health practitioners may induce more consultations than necessary, or opt for more complex treatments or procedures which are subsequently charged at higher rates. To address the limitations of FFS and promote value-based care, alternative payment models (APMs) have been developed. Salaries and blended payments, used amongst physicians in Canada, as Wranik and Durier-Copp (2009) describe are an example of and APM. The focus is on rewarding providers for achieving better patient outcomes and delivering high-quality, cost-effective care.

The use prospective payment is sometimes seen as a more suitable mechanism. Where prospective payment of providers has been implemented in developed countries, a key objective was ensuring that the level of health services does not go beyond what is necessary and sufficient. However, it is crucial for the design of prospective payment systems to be such that the regulated price reflects the cost of care, since the literature shows evidence that intentionally placing the provider at financial risk may incentivise inducing care in other services offered (Amporfu, 2011; Zabrodina, 2020).

Another alternative payment model is capitation, where providers receive a fixed payment per patient enrolled in their practice, regardless of the volume or complexity of services delivered. Capitation aligns provider incentives with patient health outcomes by encouraging preventive

care, care coordination, and efficient resource utilisation. Providers are motivated to keep patients healthy and avoid unnecessary interventions, as doing so reduces costs and increases profitability. By shifting the financial risk from payers to providers, capitation incentivises providers to deliver more efficient and cost-effective care while reducing the potential for SID. However, capitation also carries the risk of under-provision of services, particularly for patients with complex or chronic conditions. For providers in rural or remote areas, capitation presents the challenge of not generating enough income due to low patient populations (Wranik and Durier-Copp, 2009).

Risk-sharing arrangements, such as shared savings and shared risk contracts, are APMs that involve financial incentives based on performance metrics related to cost savings and quality improvement. In shared savings models, providers receive bonuses for achieving cost savings relative to predefined benchmarks while maintaining quality standards. Physicians are motivated to deliver efficient and effective care, as they share in the financial benefits of reducing unnecessary utilisation and improving patient outcomes. Nyweide et al. (2015) investigated the impact of a shared savings program on physician behavior regarding hospital readmissions. Physicians participating in the program were incentivised to reduce readmission rates through improved care coordination and follow-up. The study found that participating physician groups achieved significant reductions in readmission rates compared to non-participating groups, demonstrating the potential of shared savings models to mitigate unnecessary utilisation.

Shared risk contracts, on the other hand, hold providers accountable for cost overruns and poor outcomes, imposing financial penalties for deviations from agreed-upon targets. These arrangements encourage providers to adopt cost-effective practices, improve care coordination, and invest in population health management initiatives. In shared risk arrangements, insurers and healthcare providers have mutual financial interests in achieving quality and cost targets. Song et al. (2018) examined the impact of a shared savings program with downside risk on physician behavior regarding imaging utilisation for low back pain. Under the program, participating providers shared financial risk with the insurer for total healthcare costs. The study found that providers in shared risk arrangements were more likely to reduce unnecessary imaging tests for low back pain compared to those in fee-for-service arrangements, indicating the effectiveness of shared risk in mitigating PID.

In recent years, pay-for-performance programs have emerged as a means of linking provider payments to performance metrics, such as clinical quality measures, patient satisfaction, and adherence to evidence-based guidelines. Pay-for-performance programs offer financial incentives, such as bonuses or penalties, based on providers' performance against predefined quality benchmarks. By aligning financial rewards with quality improvement goals, pay-for-performance programs encourage providers to prioritise patient safety, preventive care, and evidence-based practices. Incentive programs tied to adherence to clinical guidelines can also motivate physicians to comply with recommended practices. Financial incentives, such as bonuses or pay-for-performance incentives, can be linked to providers' adherence to specific quality metrics derived from clinical guidelines. Providers who consistently adhere to guidelines and achieve quality targets may receive monetary rewards, recognition, or other incentives, while those who deviate from guidelines may face penalties or performance improvement requirements. However, pay-for-performance programs face ethical and practical challenges, such as the risk of incentives being abused and patient being refused or preferred to others (Kyeremanteng et al., 2019).

Ultimately, payment schemes for physicians should be devised in such a way that medical decisions are less affected by financial compensation. In the studies included in this review, where physicians being remunerated by fee-for-service worked alongside salaried physicians, higher levels of utilisation were observed amongst fee-for-service physicians.

Stricter regulation and monitoring of physicians' adherence to clinical guidelines

Guidelines, standards, and oversight mechanisms govern provider behaviour and ensure the appropriate use of healthcare services. One key regulatory measure to reduce SID is the implementation of evidence-based clinical guidelines and protocols. Clinical guidelines outline best practices for the diagnosis, treatment, and management of medical conditions based on scientific evidence and expert consensus. By standardising clinical practice and promoting the use of evidence-based medicine, guidelines can help prevent unnecessary medical interventions and reduce the potential for SID driven by provider preferences or financial incentives. Moreover, adherence to clinical guidelines can improve the quality of care, patient outcomes, and cost-effectiveness by reducing variations in practice and minimising the use of unnecessary tests and treatments.

Yuda (2013) describes the use of third-parties which review the invoices submitted to insurers by providers in Japan. Where a service does not seem medically necessary based on diagnostic codes and medical knowledge of the reviewers, the claim is not paid. Although not much detail is described, the author (Yuda, 2013) recommends digitising of medical information as a measure to address induced demand of health services by providers. Use of digital records has the potential to significantly enhance the efficiency and coordination of healthcare delivery while also reducing the likelihood of unnecessary services. Health information technology such as electronic health records with clinical decision support (CDS) tools can automatically alert providers when their clinical decisions deviate from established guidelines. These solutions offer real-time guidance and reminders at the point of care. For example, if a physician prescribes a medication that is contraindicated based on the patient's medical history or fails to order recommended diagnostic tests, the CDS system can prompt the provider to reconsider their decision and provide alternative recommendations aligned with clinical guidelines (Kawamoto, 2005). In addition to clinical decision support, digital health records facilitate seamless communication and information sharing among different healthcare providers involved in a patient's care. This enhanced coordination reduces the likelihood of duplicate tests, conflicting treatments and other inefficiencies. A review by Goldzweig et al. (2013) found evidence suggesting that electronic health records contribute to reducing duplicate testing and unnecessary imaging procedures.

Regular audits and peer reviews are another method of monitoring physicians' adherence to clinical guidelines. Healthcare organisations can conduct periodic reviews of physicians' practice patterns, patient charts, and treatment protocols to assess compliance with established guidelines. Peer review committees comprised of fellow physicians can evaluate individual cases and provide feedback to providers, identifying areas for improvement and opportunities to enhance adherence to clinical guidelines. This process allows for a professional dialogue regarding the medical necessity of the recommended services, potentially reducing instances of PID through collaboration and consensus (Choudry et al., 2016). Additionally, performance feedback and benchmarking data can be shared with providers to promote accountability and foster a culture of continuous quality improvement. In a study by Choudhry et al. (2016), the authors examined the impact of peer-to-peer interventions on the appropriateness of cardiac procedures. The study found that peer review discussions between cardiologists resulted in changes to the recommended treatment plans in a significant proportion of cases, highlighting the potential role of peer review in reducing unnecessary interventions.

The use of pre-authorisation in health insurance is an example of ensuring strict adherence to clinical guidelines. This process happens when a health insurance agrees that a medical service is medically necessary and is reasonably priced. It is one of the tools health insurance providers use to promote evidence-based, affordable and safe care. Typically, pre-authorisation is required for high-costs treatments. Examples of this are in-patient treatments, out-patient surgery, routine maternity appointments, kidney dialysis, rehabilitative treatment and medical evacuation or repatriation. The key benefit to the insured person is to protect them from having to pay out-of-pocket for medical expenses. However, pre-authorisation has been cricitised for delaying care as it can be time-intensive and place administrative burden on patients and providers.

Lastly, continuing medical education (CME) and professional development programs can play a crucial role in promoting adherence to clinical guidelines among healthcare providers. CME programs often focus on disseminating the latest evidence-based research and guidelines in various medical specialties. By staying abreast of current evidence, physicians are better equipped to make clinical decisions grounded in scientific evidence rather than personal preferences or financial incentives. Davis et al. (2018) evaluated the impact of a CME program on improving adherence to evidence-based guidelines for the management of cardiovascular disease (CVD) risk factors among primary care physicians. The study found that participation in the CME program led to significant improvements in physicians' knowledge, attitudes, and practices related to CVD risk factor management, resulting in better patient outcomes. CME activities often include sessions on critical appraisal skills, teaching physicians how to evaluate the validity and relevance of clinical evidence. By honing their critical thinking abilities, physicians can more effectively discern between necessary and unnecessary interventions, thereby reducing instances of SID. Moore et al. (2014) assessed the impact of a CME program on enhancing critical appraisal skills among primary care physicians. The study found that participation in the program led to improvements in physicians' ability to critically appraise research evidence and apply it to clinical practice, resulting in more rational and evidence-based decision-making. CME activities often incorporate discussions on ethical considerations in clinical practice, including the appropriate use of medical resources and avoidance of unnecessary interventions. By raising awareness of ethical issues surrounding PID, CME can encourage physicians to prioritise patient welfare over financial gain. Haque et al. (2019) examined the impact of an ethics-focused CME program on physician behavior regarding

resource allocation and healthcare utilisation. The study found that participation in the program led to increased awareness of ethical considerations and greater adherence to principles of resource stewardship among physicians. By offering regular training sessions, workshops, and educational resources focused on evidence-based medicine and guideline updates, healthcare organisations can ensure that physicians stay informed about the latest recommendations and practices in their field.

Increased use of utilisation reviews by health insurance players

A review of utilisation – also referred to as utilisation management - helps determine if healthcare services are being used efficiently and appropriately. There are three key types of utilisation review: Prior authorisation or pre-authorisation, concurrent review, and retrospective review. Pre-authorisation occurs before a clinical event, with the purpose of ensuring that the requested procedure or treatment is appropriate and will be delivered in an appropriate setting. This process supports cost containment, and may encourage effective coordination of care for the patient. Concurrent review takes place while the patient is receiving care while admitted to a facility. Its role is to provide an oversight process that permits scrutiny of the setting and appropriateness of care. Concurrent review also seeks to reduce misuse of inpatient services, and to ensure quality care during the inpatient component of care. Lastly, retrospective review occurs after care is delivered and the health services have been invoiced. During this review, the insurer seeks to confirm that the services carried out were appropriate and efficient. This typically involves reviewing the listed International Classification of Disease-10 (ICD-10) and procedure codes. Utilisation review serves as a means of ensuring that clinical guidelines are adhered to. The review of reimbursement claims currently used in Japan (Yuda, 2013) provides an example where care is reviewed and not reimbursed if deemed to be not be necessary. These mechanisms help ensure that healthcare services are delivered only when clinically indicated and that resources are used efficiently. By requiring providers to justify the necessity of services and procedures, utilisation review and prior authorisation can deter unnecessary utilisation and mitigate the potential for SID driven by financial incentives. A study by Birkmeyer et al. (2017) examined the impact of utilisation management program on reducing unnecessary spinal fusion surgeries. The program implemented evidence-based criteria to determine the appropriateness of surgery referrals. The study found that the program led to a significant reduction in the rate of inappropriate surgeries, indicating the effectiveness of utilisation review in curbing unnecessary procedures. Mehrotra et al. (2017) investigated the impact of preauthorisation

requirements for advanced imaging services. The study found that the implementation of preauthorisation led to a reduction in the utilisation of advanced imaging tests without compromising patient outcomes, suggesting that utilisation review can help curb unnecessary testing.

Provide medical information and health promotion for patients

Providing medical information and health promotion for patients is integral to empowering individuals to take an active role in managing their health and making informed healthcare decisions (Charles et al., 1997). Healthcare providers play a critical role in educating patients about their medical conditions, treatment options, and preventive measures to promote overall well-being. This information should clearly stipulate which of the courses of action are necessary and sufficient, and which are exploratory (and therefore optional). Patient education encourages individuals to ask questions about the necessity and appropriateness of medical interventions. By actively engaging with healthcare providers and seeking clarification about proposed treatments, patients can challenge potentially unnecessary procedures (Levinson et al., 2005). Educated patients are more likely to engage in shared decision-making with their physicians, where treatment options are discussed collaboratively based on the patient's preferences, values, and goals. This collaborative approach can help ensure that medical decisions align with the patient's actual needs (Stiggelbout et al., 2012).

Patient education efforts can raise awareness about the potential harms of over-utilisation of healthcare services, including unnecessary tests, procedures, and treatments. By understanding the risks associated with unnecessary interventions, patients may be more cautious about agreeing to such recommendations (Cassel et al., 2012). Educated patients are better equipped to understand their health conditions, treatment options, and potential risks and benefits. When patients have a good understanding of their medical needs, they are less likely to passively accept unnecessary tests or procedures suggested by physicians (Charles et al., 1997).

Insurers are increasingly using incentive-based health promotion programs to reduce costs and drive preventive measures. In South Africa, the largest national private health insurer, Discovery Health, has an opt-in membership to an insurance-linked incentivised health promotion known as Vitality. Patel et al (2010) assessed the association between the level of participation and inpatient medical claims among members. Results showed that among highly

engaged members, there was a lower cost per patient to the insurer, shorter hospital stays, and fewer admissions compared with low and no engagement members. For cardiovascular disease, cancers and endocrine and metabolic diseases, the highly-engaged members had lower admission rates when compared to low engagement and no engagement. These findings are consistent with similar studies, which suggest that wellness programs offered by health insurers, are an important tool for reducing utilisation of health services, and reducing costs to health systems and payers.

Healthcare providers can also leverage technology and digital health resources to enhance patient education and health promotion efforts. This may include providing access to online portals or mobile applications where patients can access personalised health information, track their progress, and communicate with their healthcare team. Additionally, providers can use multimedia tools, such as videos, infographics, and interactive tutorials, to deliver educational content in an engaging and accessible format. By providing requisite medical information and health promotion for patients, healthcare providers can empower individuals to make informed decisions about their health and adopt healthier behaviors. This not only improves patient outcomes and satisfaction but also contributes to the overall effectiveness and sustainability of healthcare delivery. This review provides multiple instances where more sophisticated diagnostic screening than necessary is provided (Zabrodina, 2020; Akbari, 2022), or where procedures that are preferred by the practitioner are not based on guidelines, or are typically indicated for more complex medical cases (Redeker et al., 2022; Akbari, 2022; Redeker et al., 2022). As a caveat, it goes without saying that health promotion initiatives cannot by any means upskill lay individuals to the same level of knowledge and expertise as higher education and training provided to practitioners. However by improving individuals' knowledge of their options, the asymmetry in information between health workers and their patients is lessened. Similarly, in the event that a health system is overburdened, such education and health promotion will inevitably be deprioritised for more pressing priorities.

Klösch et al (2021) find that patients are keen users of digital apps to support their health and disease management. The authors describe digital applications as an important strategy for helping patients improve their own health literacy. Discovery Health, the largest private health insurer in South Africa, combines the use of a mobile application which tracks habits, nutrition and personal activity. This program has been found to be associated with reinforced motivation in patients managing their own health.

To the best of knowledge, this is the first systematised review focusing on interventions or policies concerning supplier-induced demand. This is a highly relevant topic in public health given the mounting interest in utilisation rates amid countries' efforts to strengthen their healthcare systems and establish sustainable financing.

Firstly, SID distorts resource allocation within healthcare systems. If providers prioritise profitable procedures over necessary yet lower revenue care, this distorts resource allocation (Arrow, 1963). Arrow (1963) posits that this misallocation of resources can undermine the efficiency and equity goals of UHC by diverting funds away from priority areas and populations in need. Moreover, SID can exacerbate healthcare costs: By ordering more tests and procedures than necessary, costs are driven up (Folland et al., 2017). As a result, efforts to expand coverage and reduce financial barriers to care may be hindered by persistent cost escalation driven by SID. Lastly, SID can undermine the quality and effectiveness of healthcare services. Chandra and Skinner (2012) describe physicians prioritising revenue or self-interest over patient welfare, can lead to unnecessary interventions or inappropriate treatments, potentially resulting in adverse health outcomes for individuals. This compromises the goal of providing high-quality care to all individuals under UHC.

Addressing supplier-induced requires a multifaceted approach encompassing regulatory measures, reform to reimbursement mechanisms, enhancing patient education and empowerment, promoting evidence-based medicine, and implementing policies and initiatives that foster transparency and accountability in healthcare delivery. By mitigating the influence of financial incentives on provider behavior and empowering patients to make informed decisions about their healthcare needs, healthcare systems can work towards curbing the prevalence of SID and ensuring that healthcare resources are allocated more equitably.

Some limitations of the study can be identified. Firstly, the nature of the review is systematised because there was only one reviewer. The convenience of the study selection approach implemented in the current might have introduced human error. Regardless, the approach undertaken was a pragmatic necessity. Secondly, the generalisability of the findings may be limited since the reviewed studies were not geographically diverse. The majority of studies were reported out of developed regions: Only one country in Africa was covered by the reviewed studies, and no study covered South America.

CONCLUSION

Understanding policy response to supplier-induced demand and its evidence-based application is crucial for the design of universal health coverage and private health insurance, particularly when cost containment is a priority. Further research is needed on the implementation of effective measures in response to induced demand for health services in both developed and developing countries. Supplier-induced demand presents significant implications for universal health coverage (UHC), a paramount goal in global health

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