Mapping conflict of interests: scoping review

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ABSTRACT

OBJECTIVE

To identify all known ties between the medical product industry and the healthcare ecosystem.

DESIGN

Scoping review.

METHODS

From initial literature searches and expert input, a map was created to show the network of medical product industry ties across parties and activities in the healthcare ecosystem. Through a scoping review, the ties were then verified, cataloged, and characterized, with data abstracted on types of industry ties (financial, non-financial), applicable policies for conflict of interests, and publicly available data sources.

MAIN OUTCOME MEASURES

Presence and types of medical product industry ties to activities and parties, presence of policies for conflict of interests, and publicly available data.

RESULTS

A map derived through synthesis of 538 articles from 37 countries shows an extensive network of medical product industry ties across parties and activities in the healthcare ecosystem. Key activities include research, healthcare education, guideline development, formulary selection, and clinical care. Parties include non-profit entities, the healthcare profession, the market supply chain, and government. The medical product industry has direct ties to all parties and some activities through multiple pathways; direct ties extend through interrelationships among parties and activities. The most frequently identified parties were within the healthcare profession, with individual professionals described in 422 (78%) of the included studies. More than half (303, 56%) of the publications documented medical product industry ties to research, with clinical care (156, 29%), health professional education (145, 27%), guideline development (33, 6%), and formulary selection (8, 1%) appearing less often. Policies for conflict of interests exist for some financial and a few non-financial ties; publicly available data sources seldom describe or quantify these ties.

CONCLUSIONS

An extensive network of medical product industry ties to activities and parties exists in the healthcare ecosystem. Policies for conflict of interests and publicly available data are lacking, suggesting that enhanced oversight and transparency are needed to protect patient care from commercial influence and to ensure public trust.

WHAT THIS STUDY ADDS

The medical product industry maintains numerous ties with all major healthcare parties and activities. This extensive network of ties is often unregulated and non-transparent. Enhanced oversight and transparency are needed to shield patient care from commercial influence and to preserve public trust in healthcare.
only financial ties but also non-financial ones, such as medical product manufacturers offering healthcare professionals research data, authorship, and other opportunities for professional advancement.13-15

Yet, with few exceptions,1 2 16 17 most analyses focus on one or two narrow types of ties between the medical product industry and a single party, such as healthcare professionals, hospitals, or journals, or a single activity, such as research, education, or clinical care. The reality is that companies take a multipronged approach to developing and marketing products, enlisting the assistance of multiple influential parties throughout the healthcare ecosystem. The US opioid epidemic, for example, provides numerous instances of pharmaceutical manufacturers strategically developing financial ties with multiple entities in the healthcare ecosystem and leveraging those to create secondary influences, resulting in profound patient harm.16 17 The complex interactions evident in the case of opioids, however, are seldom documented or explored in the literature on conflict of interests. We are unaware of any study that has endeavored to identify and characterize the full extent of medical product industry ties across the healthcare ecosystem, which involves individuals who and organizations that deliver healthcare, as well as politicians, regulators, supply chain entities, and others who shape the practice of medicine indirectly. The entire spectrum of direct ties, and subsequent indirect pathways for potential influence, could result in cumulative effects on patient care and public trust and are thus important to systematically document and assess.

We therefore developed an evidence based map to encompass the complex network of ties between the pharmaceutical, medical device, and biotechnology industries and healthcare ecosystem. To identify all known pathways that could enable companies to ultimately influence patient care, we systematically explored the full range of direct industry ties, both financial and non-financial, across the ecosystem, as well as indirect ties to and from other parties and activities within the healthcare ecosystem. We also cataloged the presence of conflict of interests oversight along these routes, as well as the extent to which industry ties are transparent to regulators, the public, and other key audiences. Our results provide a system level view of the medical product industry’s potential for influence across the healthcare ecosystem, ultimately culminating at patient care.

Methods
Our methods were twofold. First, we used targeted literature searches and expert input to draft a map depicting the ties between the pharmaceutical, medical device, and biotechnology industries and the key healthcare related activities and parties that shape utilization (ie, prescribing and use of medical devices and biotechnology products). Then we conducted a systematic scoping review to verify and refine the map and to catalog and characterize all documented industry ties across the healthcare ecosystem.

Mapping
We began by reviewing publications known to the research team (in particular, the Institute of Medicine’s extensive 2009 report1) and cataloged all identified parties (individuals and organizations involved in healthcare, such as hospitals, prescribers, public health agencies), activities (domains of clinical inquiry, judgment, and decision making, such as research, clinical care, guideline development), and linkages among them. Using terms such as “pharmaceutical industry”, “device industry”, and “conflict of interest”, and the “similar articles” function, we then conducted a targeted search of the medical and scientific literatures (through PubMed) to document industry ties to these parties and activities, as well as any additional parties, activities, and linkages in the healthcare ecosystem. To further explore additional, poorly documented ties, we used Google to search the gray literature, business publications, and lay literature, such as newspaper and magazine articles. All investigators independently performed searches in Google until saturation was achieved—that is, no new activities, parties, or linkages being identified. We used these findings to draft a preliminary map of the healthcare ecosystem, showing the network of ties between industry and each party and activity, as well as ties among parties and activities.

Next we obtained input from an international panel of experts with broad expertise in industry ties and deep knowledge of specific parties and activities (supplementary appendix A). We selected prominent experts on industry ties to healthcare parties or domains, or both. Experts were also selected who could reflect on these problems internationally, not just in the US context. Additionally, we included experts with deep knowledge of pricing and distribution systems, as these topics seldom appear in the literature on conflict of interest. Through WebEx we conducted semi-structured interviews (supplementary appendix B) with experts individually to review the map, using their feedback on an ongoing basis to further search the literature, evaluate depicted ties, identify missing ties, and refine the map accordingly. We worked iteratively, making alterations to the general approach, categorizations, and visual presentation until reaching agreement within the research team. Experts were recruited until saturation was achieved (with no further changes suggested), which occurred after eight experts had been interviewed. We also solicited additional comments and final approval from the experts by email. Finally, we worked with design experts to optimize the visual clarity of the map.

Scoping review
We conducted a systematic scoping review of medical product industry ties to verify and refine the map, cataloging and characterizing documented financial and non-financial ties across the broad healthcare ecosystem. Our methods are reported according to the preferred reporting items for systematic reviews and
The data abstraction form (supplementary appendix E) was piloted on random samples of 10 included studies and modified as needed using feedback from the team. Full data abstraction began after four rounds of pilot testing, once sufficient intercoder agreement had been obtained (93.48-100%); calculable $\kappa$ ranged from 0.63-0.95, indicating substantial to near perfect agreement. Subsequently, one of two team members (MM, SZ) abstracted each included study, with additional feedback from others (SC, DK) as needed.

Methodological quality appraisal
We did not appraise methodological quality or risk of bias of the included articles, which is consistent with guidance on the conduct of scoping reviews.

Synthesis
Microsoft Excel was used to create descriptive statistics to characterize the publications identified in our scoping review along the extracted domains. Data from our scoping results was used to refine and verify our map, identifying, characterizing, and organizing all known pathways by which companies might potentially influence patient care. We created additional maps to separately show industry’s financial and non-financial entry points to the system.

Patient and public involvement
We did not include patients or members of the public in the research, as this was beyond the study’s scope. A patient representative reviewed the manuscript after submission.

Results
Mapping: Industry and the healthcare ecosystem
Figure 1 depicts the healthcare ecosystem, mapping the complex network of ties associated with the pharmaceutical, medical device, and biotechnology industries across the key activities and parties in the healthcare ecosystem. Beyond its direct ties to all parties and some activities, the medical product industry has numerous indirect ties across the healthcare ecosystem. Similarly, non-financial ties might reinforce or extend companies’ financial ones (fig 2 and fig 3).

Relevant parties in the system operate in diverse sectors of public and private life and include non-profit entities (eg, foundations, advocacy groups), the healthcare profession (eg, journals, medical schools, individual professionals), the market supply chain (eg, payers, purchasing and distribution agents), and government (eg, public officials, regulators). The medical product industry also has direct ties to patients and prescribers (box 1 and supplementary appendix F). Notably, the prescriber category is distinct from the individual professionals category, although some clinicians might belong to both categories: Prescriber denotes clinicians in a patient care role (eg, physicians, nurses, physician assistants, advanced nursing professionals) who directly determine utilization of pharmaceuticals, medical devices, and biotechnology products, whereas individual professionals more broadly includes clinicians, researchers, and other healthcare professionals and experts engaged in research, guideline development, formulary selection, health professional education, and other extraclinical activities.
Many medical product industry ties to these parties are financial, involving money or items of financial value, as when companies negotiate prices with supply chain agents; purchase reprints from journals; make contributions to public officials for campaigns; provide consultancy, speaking, or key opinion leader payments to healthcare professionals; or financially support government agencies, healthcare organizations, and non-profit entities through donations, grants, or fees. Other ties are non-financial, as in companies’ direct-to-consumer advertising to patients, advertising and detailing of prescribers, unpaid professional education.
consultancy work, or the offer of data, authorship, and other professional opportunities to clinicians and researchers. All party types have financial ties to medical product companies. Only payers and distribution agents lack additional, non-financial ties (table 1, supplementary appendix E).

The healthcare ecosystem also includes five activities of clinical inquiry, judgment, and decision making at risk of commercial bias (box 1 and table 1). The medical product industry directly participates in two such activities—research and guideline development. Again, ties might be financial or non-financial, or both.
For example, companies might directly fund research or guideline development and might directly provide data, content, or other non-financial assets in support of these activities.

The medical product industry also has numerous, indirect connections to three additional activities—formulary selection, medical education, and clinical care. We found no documentation to support that companies directly participate in these activities. However, they maintain extensive ties with parties who participate in these activities. For example, individuals and organizations with medical product industry...
Box 1: Definitions of terms used in the healthcare ecosystem

**Medical product industry**
- Pharmaceutical, medical device, and biotechnology companies that develop and manufacture medical products used in patient care

**Parties**
- **Public officials**—elected or appointed individuals in government positions
- **Regulators**—government bodies that regulate healthcare delivery or payments
- **Public health agencies**—government agencies that are involved in healthcare but do not directly deliver or regulate healthcare
- **Payers**—private and public health insurers
- **Purchasing and distribution agents**—organizations that mediate pharmaceutical pricing, payment, and distribution (eg, pharmacy benefit managers, group purchasing organizations, wholesalers)
- **Care delivery organizations**—facilities in which clinical care occurs, including hospitals, medical centers, clinics, private practices
- **Medical education companies**—independent privately held businesses, usually for profit entities, that provide education to healthcare professionals
- **Medical schools**—institutions that award degrees for doctor of medicine or doctor of osteopathic medicine and support academic activities
- **Professional societies**—membership organizations consisting, and serving the interests, of healthcare professionals of the same type (eg, nurse practitioners) or from the same specialty (eg, family practitioners); activities might include education, development of guidelines and ethical codes, lobbying and advocacy, and publishing
- **Journals**—publications that report clinical and scientific information to physicians and other healthcare professionals
- **Individual professionals**—clinicians, researchers, journal editors, healthcare executives, and other experts engaged in research, guideline development, formulary selection, clinical education, or other professional activities outside of clinical care
- **Foundations**—entities that support charitable activities by making grants to unrelated organizations or institutions or to individuals for scientific, educational, cultural, religious, or other charitable purposes
- **Advocacy organizations**—entities that provide patient focused or caregiver focused support, advocacy, and education, often focused on a disease or set of diseases
- **Prescribers**—clinicians engaged in patient care activities, including prescribing and use of medical devices and biotech products (eg, physicians, nurse practitioners, physician assistants)

**Activities**
- **Research**—rigorous investigation into biology, human disease, or healthcare delivery, the results of which guide best healthcare practices
- **Health professional education**—Knowledge or skill acquisition related to healthcare that occurs away from patients as a free standing activity, with undergraduate, graduate, and continuing (postgraduate) components
- **Guideline development**—systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances
- **Formulary selection**—the development of ranked or tiered lists of prescription drugs that are covered by a health plan or stocked by a healthcare facility; tiers typically carry different levels of cost sharing (eg, copayments or coinsurance levels)
- **Clinical care**—Clinical interaction between patient and healthcare professional

**Ties**
- **Financial**—economic assets or monetary payments, including but not limited to consulting fees, research funds, salary, stocks, patents, licenses, gifts, meals, travel funds, educational funds, and materials and equipment for research, education, and clinical care
- **Non-financial**—other assets, including but not limited to information (eg, advertising, literature, reprints, and textbooks, and educational and training sessions), authorship, and data

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**Table 1 | Examples of parties’ and activities’ direct financial and non-financial ties to the medical product industry**

| Activities | Financial ties | Non-financial ties |
|------------|---------------|--------------------|
| Research   | Funding       |                    |
| Guideline development | Funding | |
| Parties    |               |                    |
| Public officials | Campaign contributions, gifts | Lobbying, professional relationships, information |
| Regulators | Funding | Professional relationships |
| Public health agencies | Funding | Professional relationships |
| Payers | Rebates | |
| Purchasing and distribution agents | For example, rebates, discounts | |
| Care delivery organizations | Funding, gifts, food, patents, royalties | Detailing, information and content, samples, board memberships |
| Medical education companies | Funding | Content |
| Medical schools | Research grants, funding of fellowships, funding of sponsored meetings | Board memberships |
| Professional societies | Funding, grants, purchasing membership lists | Content at meetings |
| Journals | Ads, supplements, reprints | Content |
| Individual professionals | Gifts, samples, meals, grants, consulting and speaking fees, key opinion leader payments | Professional opportunities, data for research, content, guest authorship |
| Foundations | Funding | Professional relationships |
| Advocacy organizations | Funding | Content, board memberships |
| Prescribers | Reprints, patient materials | Adverts, detailing, throw away journals and other marketing products |
| Patients | Copay coupons | Direct-to-consumer adverts, other messages and content |
ties often participate in formulary decision making, educational activities, or patient care. Similarly, linkages among activities offer companies indirect ties across the healthcare ecosystem—for example, research informs guideline development, formulary selection, and health professional education.1 2 The clinical care activity is unique; representing the intersection between patients and prescribers, it is shaped by all other activities and is the ultimate target of industry interest.1 38 59

Scoping review
The literature search resulted in 2457 citations (fig 4), after elimination of duplicates. On screening of the titles or abstracts and assessing full text for eligibility, we included 538 articles for data abstraction and synthesis (table 2). The articles were published between 1980 and 2019, with half appearing after 2012. The publications spanned 37 countries, with 348 (65%) based in the United States and 190 (35%) in other geographical regions. Most of the articles (451, 84%) were peer reviewed research studies. Overall, 498 (93%) examined pharmaceutical companies, 162 (30%) studied the medical device and biotechnology industries, and 22 (4%) included all three. Notably, nearly all articles in our analysis documented financial transactions (501 (93%)), with non-financial ties appearing less often (158 (29%)).

The most frequently identified parties were within the healthcare profession. Individual professionals...
were described in 422 (78%) of the studies, prescribers in 65 (12%), medical schools in 34 (6%), and professional societies in 31 (6%). All other parties appeared in fewer than 5% of the included studies (table 2). The medical product industry’s party ties first appeared in the literature in 1980; however, our scoping review found recent citations (2018 or later) for ties to all parties except payers and medical education companies (the most recent documentation dated from 2010 and 2008, respectively).

In total, 303 (56%) of the publications documented medical product industry ties to research, with clinical care and health professional education appearing somewhat less often: 156 (29%) and 145 (27%), respectively. Ties to guideline development and formulary selection appeared in 33 (6%) and eight (1%) publications, respectively (table 2). Although these activity ties appeared in the literature as early as 1980, our scoping review also identified citations dating from 2018 or later for all activities.

**Oversight and transparency**

For the medical product industry’s direct ties to parties and activities, table 3 documents the presence or absence of conflict of interests oversight and public data, as uncovered by our scoping review or documented on Medispend Legislative Watch. Policies for medical product industry ties are widespread among healthcare professionals and organizations, with numerous national and international bodies promulgating standards for managing such exchanges. Few, however, substantively deal with non-financial ties. Government parties are subject to varying federal, state, and local policies. Medical product industry communications to patients are federally regulated in the US and New Zealand and more tightly restricted elsewhere, but no established guidelines or policies seem to deal with companies’ financial incentives to patients (eg, copay coupons). Similarly, we found no conflict of interests oversight for medical product industry exchanges with non-profit organizations or supply chain agents.

Public databases are far from universal, and the ones we identified exclusively deal with financial transactions (table 3). For example, in the US, Open Payments makes transparent most but not all payments from the medical product industry to teaching hospitals and some prescribers (physicians and dentists, with data collection expanding in 2021

### Table 3 | Medical product industry interactions: Sources of transparency and conflict of interests oversight, by activity and party

| Activities | Conflict of interests oversight | Public databases |
|------------|---------------------------------|------------------|
| Research   | None                            | National laws in Belgium, Brazil, Colombia, Denmark, Estonia, France, Indonesia, Saudi Arabia, Slovakia, South Korea, and US. |
| Health professional education | State law in Vermont | National laws in Brazil, Colombia, Denmark, France, Indonesia, Saudia Arabia, Slovakia, South Korea, and US; state law in Vermont. |
| Guideline development | IOM1 and GiN guidelines | National law in Brazil. |
| Formulary selection | State law in Massachusetts and state law in Vermont. | National law in Colombia; state law in Massachusetts. |
| Clinical care | State laws in California, Maine, Massachusetts, Minnesota, New Jersey, and Vermont; varying institutional policies | National laws in Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |
| Parties | Public officials None | OpenSecrets.org, FollowTheMoney.org |
| | Regulators None | None |
| | Public health agencies None | None |
| | Payers None | None |
| | Purchasing and distribution agents None | None |
| | Care delivery organizations | IOM1 and AAMC2 guidelines; state law in Vermont. | National laws in Belgium, Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |
| | Medical education companies | ACCME policies, state law in Vermont. | State law in Vermont. |
| | Medical schools | State law in Vermont, AAMC, ACCME, ACGME, varying Institutional Policies | National laws in Belgium, Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |
| | Professional societies | CMSS guidelines | National laws in Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |
| | Journals | ICMJE guidelines | None |
| | Individual professionals | State laws in California, Maine, Massachusetts, Minnesota, New Jersey, and Vermont; varying institutional policies | National laws in Belgium, Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |
| | Foundations | State law in Vermont. | National laws in Colombia and France; state law in Vermont. |
| | Advocacy organizations | State law in Vermont. | National laws in Brazil, Colombia, Denmark, and France; state law in Vermont. |
| | Prescribers | Varying institutional policies | National laws in Brazil, Colombia, Denmark, Estonia, France, Hungary, Indonesia, Israel, Latvia, Philippines, Portugal, Romania, Saudi Arabia, and US. |

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AAMC=Association of American Medical Colleges; ACCME=Accreditation Council for Continuing Medical Education; ACGME=Accreditation Council for Graduate Medical Education; CMSS=Council of Medical Specialty Societies; GiN=Guidelines International Network; ICMJE=International Committee of Medical Journal Editors; IOM=Institute of Medicine.
to include physician assistants, nurse practitioners, clinical nurse specialists, certified registered nurse anesthetists, and anesthesiological assistants), and Open Secrets and FollowTheMoney track companies’ contributions to state and federal candidates and officials for political campaigns. In Europe, the United Kingdom, Australia, and elsewhere, public reporting systems provide varying degrees of transparency into medical product industry payments to diverse prescribers and individual professionals (in some cases, including physician assistants, nurse practitioners, and others), care delivery organizations, health professional schools, professional societies, foundations, and advocacy organizations. We found no transparency sources for medical product industry ties to regulators, public health agencies, payers, purchasing and distribution agents, or journals.

Discussion
We conducted an extensive scoping review and interviewed experts to document an extensive network of medical product industry ties to activities and parties in the healthcare ecosystem. The pharmaceutical and medical device and biotechnology industries have established numerous ties with non-profit entities, the healthcare profession, the market supply chain, and government. Beyond clinical care, critical activities in the network include research, health professional education, guideline development, and formulary selection.

We found that conflict of interests oversight exists for some financial and a few non-financial ties between the medical product industry and other parties in the healthcare ecosystem, potentially leaving many interactions unregulated. Moreover, public data sources seldom describe or quantify these ties. This observed lack of conflict of interests oversight and transparency offers ample opportunities for medical product industry ties to potentially influence diverse clinical activities, and ultimately patient care, without the public’s knowledge. Efforts by all parties are urgently needed to deal with these gaps to protect patient care from commercial bias and to preserve public trust.

Implications
Our mapping illustrates the ways in which medical product industry influence could flow through a complex network to reach clinical care and impact patients. Companies maintain direct ties to all parties and some activities; these direct ties then potentially extend through interrelationships among parties and activities. Industry influence might accumulate or amplify as it travels through multiple pathways to reach clinical care in ways that could be completely opaque to both clinicians and patients, yet indirect ties and the cumulative effects of those ties are seldom, if ever, examined in the literature. The medical product industry’s direct financial ties to clinicians are known to influence prescribing and other activities in which the industry participates. Our mapping illustrates how evaluating individual industry ties might underestimate the routes and magnitude of potential influence.

The findings from our scoping review illustrate the breadth of medical product industry ties to the healthcare ecosystem, with studies from 37 countries spanning six continents—documenting the great scope and diversity of industry targets across the globe. At the same time, our findings highlight the outsized focus in the literature on the healthcare profession, especially on individual professionals and prescribers. This emphasis could result from the relative availability of these data through Open Payments and other public sources. By compiling and mapping the full network of the medical product industry’s reach across the healthcare ecosystem, we depict the ways in which potential influence moves well beyond the spheres of individual professionals and prescribers.

Recent examples illustrate the power and implications of the complex ties we expose. Appendix G details how opioid manufacturers provided funding and other assets to prescribers, patients, public officials, advocacy organizations, and other healthcare parties, who, in turn, pressured regulators and public health agencies to quash or undermine opioid related guidelines and regulations. Moreover, we found no evidence that the medical product industry’s activities around opioids differed from routine company practices. Analyses of past cases of consumer harm related to medical product industry promotion, as with the drug Vioxx (rofecoxib; Merck)91 92 and the weight loss drug fenfluramine-phenteramine (American Home Products),93 have shown a similar, multipronged strategy of outreach to numerous parties, culminating in severe patient harm. Many additional examples of harm from industry promoted products are likely to have been unrecognized or unattributed to medical product companies’ activities. Such harms remain unexplored, but many might have led to physical harms as well as social, psychological, and other negative effects on patients. Moreover, medical product industry influence could undermine healthcare equity and sustainability by driving up costs for individual patients and the healthcare system overall. In the context of eroding patient trust in the healthcare system, elucidating mechanisms of undue influence is critical. Our analysis and resulting map will facilitate better understanding of these pathways of potential influence and might enable regulators and the healthcare community to better protect patients and ensure public trust.

Limitations of this study
This study has several limitations. First, our findings are limited to medical product industry ties known by our experts or documented in the academic, gray, and lay literatures. Additional ties might yet exist, although our strategy of systematic, duplicative searching and feedback from an international panel of experts is unlikely to have missed common or important ties. Second, we cannot quantify the magnitude of medical product industry influence along pathways in our map.
Third, our study documents not actual bias but the pathways for potential influence across the system. Fourth, our scoping review included older evidence that might not reflect current practices; however, half of included papers were published after 2012, and medical product industry ties to nearly all parties and activities have evolved. Finally, we focused on ties, although we did supplement our search by consulting MediSpend Legislative Watch.19 More research is needed to explore these issues.

Conclusions
The medical product industry maintains an extensive network of financial and non-financial ties with all major healthcare parties and activities. This network seems to be mostly unregulated and opaque. Although the medical product industry is a critical partner in advancing healthcare, companies must also work to maximize profits as part of fiduciary responsibility to shareholders or owners and thus use all available means to promote products. With absent effective conflict of interests oversight, such promotion might ultimately threaten the integrity, equity, and sustainability of healthcare systems and impact individual patients. It is therefore up to other key parties, including the healthcare profession and policy makers, to effectively manage commercial influence, protect patient safety, and ensure public trust.

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Contributors: DK, SC, BB, and PB interviewed experts. DK, SC, MM, and SE did the scoping review. MM, SC, and DK analyzed the data. BB, SC, SC, and DK produced the figures. SC, and DK drafted the manuscript. SC, DK, MM, SC, and PB revised the manuscript. SC and DK are the guarantors. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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results agree with the findings of the present study. Furthermore, the current findings are consistent with previous research indicating that
commercial relationships between pharmaceutical companies and healthcare providers can influence prescribing behavior and patient outcomes.

The implications of this study are significant for both healthcare providers and policymakers. On one hand, the evidence suggests that
incentives to prescribe certain medications may undermine patient safety and professional integrity. On the other hand, the financial incentives
for pharmaceutical companies to promote certain medications can lead to increased costs for healthcare systems and may contribute to healthcare
financing challenges. Hence, efforts to reduce conflicts of interest are crucial for maintaining public trust in the healthcare system and ensuring
equitable access to quality care.

In conclusion, the study highlights the need for continued vigilance and reform in the pharmaceutical industry to address
conflicts of interest and promote transparency. Further research is necessary to explore the long-term effects of these relationships and to develop
effective strategies for minimizing their impact on patient care and public health.