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Evidence for Overuse of Medical Services Around the World

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Summary

Overuse, which is defined as the provision of medical services that are more likely to cause harm than good, is a global problem that afflicts rich and poor countries alike. This article reviews the definition of overuse, methods for measuring overuse, harms from overuse, and the evidence for worldwide overuse of many types of services.

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Introduction

Overuse, which Chassin and Galvin defined as the provision of medical services for which the potential for harm exceeds the potential for benefit,¹ is increasingly recognized around the world. Directly measuring overuse requires a definition of appropriate care, which is often challenging. In the United States, estimates of spending on overuse vary widely: conservative estimates based on direct measurement of individual services range from 6% to 8% of total health care spending,² while studies of geographic variation (an indirect measure) put the proportion of Medicare spending on overuse closer to 29%.³ Around the world, overuse of some individual services may be as high as 80% of cases (see Figure 2: Overuse of Selected Services in Four Countries).⁴ While overuse has been best documented in high-income countries (HICs), low- and middle-income countries (LMICs) are not immune, and evidence suggestive of widespread overuse is accumulating from countries and health systems as diverse as Australia,⁵ Spain,⁶ Israel,⁷ Brazil,⁸ and Iran.⁹ Overuse can coexist with unmet health needs, particularly in LMICs.

The purpose of this paper is to highlight the significance of the problem of overuse and explore what is known about its scope and consequences around the world. We draw on five systematic reviews^{4,10–13} on overuse to help inform this paper, supplemented with perusing of reference lists and additional structured searches of scientific and grey literature. Subsequent papers in this series examine underuse around the world, the causes of overuse and underuse, and potential remedies for both.

What is overuse?

“Though the doctors treated him, let his blood, and gave him medications to drink, he nevertheless recovered.”

- Leo Tolstoy, *War and Peace*

While Chassin and Galvin’s definition of overuse is succinct, and may have broad intuitive appeal, it is difficult to operationalize. To directly measure overuse requires a definition of appropriateness for a service, based on evidence for the balance of benefits and harms for a population or individuals. However, quantifying benefits and harms is often problematic, because evidence of benefits is often incomplete; for many services, harms have been poorly documented;¹⁴ and the threshold between appropriate and inappropriate care may vary among patients or groups of patients. In addition, the role of costs in defining low value services varies in different settings (see Box 1: The role of cost in defining overuse and low-value services).

BOX 1

The role of cost in defining overuse and low-value services

Eliminating clearly ineffective services would reduce both potential harm to patients and excess costs, since ineffective treatments and tests cannot be cost effective. Unfortunately, clearly ineffective services are greatly outnumbered by grey-zone interventions. Many grey-zone interventions benefit very few patients or provide only small benefit relative to

costs, and thus are not cost effective. Paying for such low-value services poses an opportunity cost, leaving less money available for addressing unmet health needs and reducing funds to improve the socio-economic determinants of health. While cost-effectiveness analysis, which can quantify these tradeoffs, is formally considered in coverage decisions in some HICs, such as Australia, Canada and the UK^{21–23} and in an increasing number of LMICs,²⁴ it is not included in appropriateness determinations in the US.²⁵

Ultimately, overuse can be thought to occur along a continuum of services. At one end lie tests and treatments that are universally beneficial when used on the appropriate patient, such as blood cultures in a young otherwise healthy patient with sepsis, and insulin for patients with Type 1 diabetes. At the other end of the continuum are services that are entirely ineffective, futile, or pose such high risk of harm to all patients they should never be delivered, such as the drug combination fenfluramine-phenfluramine for obesity.¹⁵ Most tests and treatments fall into a more nebulous grey zone,^{16,17} which includes: services that offer scant benefit to most patients (e.g. glucosamine for osteoarthritis of the knee); those for which the balance of benefits and harms varies substantially among patients (e.g. opioids for chronic pain, antidepressant medications for adolescents); and the many services that are backed by little evidence to help decide which patients, if any, might benefit and by how much (e.g. routine blood testing in patients with hypertension).¹⁸ (See Figure 1: Grey Zone Services.) Even when robust consensus processes have led to criteria defining appropriateness of tests and treatments (such as those developed for cardiology services in the U.S.), appropriateness can remain uncertain in many individual cases.¹⁹

Chassin and Galvin's simple formulation is further muddled by the question of whose values and preferences should determine the balance between potential benefits and acceptable harms. Certainly different patients facing a choice among potentially beneficial treatments will vary in their views of the tradeoffs of each.²⁰ Thus individual patients' values and preferences may be critical for defining appropriate care for many conditions in the grey zone. Unfortunately clinicians often have poor understanding of patient values, incorrectly assuming in some cases that a patient prefers to avoid aggressive or invasive intervention, and in others that the patient wants more rather than less care. This "preference misdiagnosis" contributes to overuse (and underuse) when clinicians deliver a service that is wrong for that individual patient.

Measuring overuse

Overuse can be measured in a variety of ways. Overuse of a specific service can be measured directly in a population, using patient registries or medical records. This approach requires a reliable definition of appropriateness for a given service, generally using an evidence- or consensus-based guideline, or a multidisciplinary iterative panel process (e.g. the RAND Appropriateness Method) to define necessary and unnecessary use. Rates of overuse are then calculated as either the proportion of delivered services that are inappropriate or as the proportion of patients with a disorder who receive the service inappropriately. This direct measure is the most reliable indicator of overuse, and a growing

body of literature, including several systematic reviews,^{4,10–13} have employed it. There are, however, several challenges inherent in this approach when applied to many health care interventions.¹² First, as discussed above, evidence for defining appropriate care is lacking in many clinical situations, precluding direct measurement of overuse of those services. Second, even if evidence is available, guidelines often lack necessary details for defining the appropriateness of care in individual patients, while iterative panel processes, which incorporate more nuance, are costly and time consuming. Electronic health records (EHR), and the development of large datasets informed by clinical information from EHRs has facilitated measurement of overuse in some contexts (e.g. the U.S. Veteran’s Affairs system^{26,27}) and may have broader applicability in the future. However, EHRs alone are not likely to enable widespread direct measurement of overuse.

A growing literature seeks to expand knowledge of overuse through an indirect measure: identifying unexpected variations in health care utilization. Variations in utilization which are not attributable to differences in patient or population characteristics have been documented both within and among countries and health systems.^{1–5,8,28,29} While these variations are often not related to overuse (or underuse) per se, but rather to different rates of discretionary care (or services for which the evidence does not point clearly to a right answer,¹⁶ such as revisit interval for diabetics), unexpectedly high rates of use of a particular service can reflect overuse.^{6,7} In more recent years, investigators have used large databases to explore variations in the use of specific services as a method for documenting probable overuse.^{30,31} Table 1 provides examples of both direct and indirect evidence documenting overuse of specific services around the world. Some investigators have moved beyond individual services to evaluate rates of general overuse in a system by evaluating variations in the use of groups of possibly overused services,^{5,32–34} but these methods are not yet well established.

Related concepts

We use the term “overuse” to refer to any services that are unnecessary in any way and for any reason. The related terms, “overtreatment” and “overtesting,” indicate the inappropriate delivery of particular types of services.

Another related term, *overdiagnosis*, is commonly described as the diagnostic labeling of abnormalities or symptoms that are indolent, non-progressive or regressive, and that if left untreated or treated later will not cause significant distress or shorten the person’s life.³⁵ This definition can be complicated by the varying natural history of specific diseases, and does not entirely encompass the various settings in which overdiagnosis occurs or the role it plays in overuse.³⁶ Overdiagnosis can occur as a consequence of screening (including recommended screening). For some screening tests, such as cervical cancer screening,³⁷ the small risk of overdiagnosis and subsequent overtreatment are outweighed by the reduction in risk of death. For other screening tests, however, the balance is less clear³⁸ and overdiagnosis may be a significant driver of overuse in the form of aggressive overtreatment of clinically insignificant findings.^{5,39} (Paper 3 in this series, “Drivers of Poor Medical Care,” will discuss in greater detail overdiagnosis and other drivers of overuse, such as defensive medicine, which has been associated with aggressive diagnostic testing in the

U.S.⁴⁰ and has been identified by physicians in several countries^{41–43} as an important reason for overusing tests and treatments.)

Overdiagnosis can also result when the definition of disease or abnormality is widened, leading to populations previously considered “normal” or healthy being labeled as diseased. This phenomenon is referred to as *overmedicalization* (or in some cases *disease mongering*) and can result in treatment of essentially healthy patients in whom potential benefit is small and likely to be outweighed by harms. A review of recent US guidelines showed that for ten of the 16 guidelines studied, disease definition had been widened, potentially leading to overuse.⁴⁴ Lowering risk thresholds for treating cholesterol has led to a growing proportion of populations in many countries being prescribed lipid-lowering drugs with unclear benefit.^{45,46} A broadened definition of chronic kidney disease that is used in many countries, while potentially beneficial for ensuring safe drug dosing, has led to large numbers of asymptomatic older people being labeled as ill; as many as 30% of older adults diagnosed with moderately advanced kidney disease (stage 3A) have no urine markers of kidney damage.⁴⁷ In children, overdiagnosis can occur in such frequently diagnosed conditions as Attention Deficit Hyperactivity Disorder (ADHD), bacteremia, food allergy, hyperbilirubinemia, obstructive sleep apnea, and urinary tract infection.⁴⁸

Worldwide prevalence of overuse

There is increasing recognition that overuse is a problem around the world, but how significant the problem is has not yet been defined. A 2012 systematic review of the prevalence of the overuse of services in the US noted that the majority of studies that directly measured overuse were focused on a relatively small number of services.¹² However, indirect evidence, such as studies of geographic variation, suggests that overuse is not limited to these services in the U.S.⁷¹ A more recent systematic review⁴ of global overuse categorized 83 overused or low-value services from studies including large sample sizes (more than 800 patients).^{27,72–95} These authors identified studies from four countries (with US studies predominating) and found that rates of overuse of various services ranged from about 1 to 80 percent (see Figure 2). For many HICs and for LMICs, the evidence of overuse is sparser and largely indirect, though it appears to be growing. (See for example a 2014 report on geographic variation in health care in 13 countries.⁵¹) Below, we describe rates of overuse around the world of a selection of clinical services. We focused our attention on services that have been most commonly described in systematic reviews and other literature, and services whose overuse has the potential for significant impact on patients or health systems.

Overuse of Medications

One of the best-documented examples of overuse of medications in both HICs and LMICs is the inappropriate use of antibiotics, a worldwide problem with significant consequences for antimicrobial resistance. Many studies have addressed inappropriate antibiotic use in patients with viral upper respiratory infections. A 2012 systematic review of overuse in the US system found 59 studies documenting widely variable rates of overuse of antibiotics for upper respiratory infections.¹² In Europe, there are high rates of antibiotic prescribing for

viral URIs in Poland, Sweden, and the UK with half of patients receiving unnecessary antibiotics,^{96–98} and across the continent studies have documented variable rates of antibiotic prescribing for patients with acute cough, with no associated differences in rates of recovery,⁹⁹ suggesting overuse.

Evidence of antibiotic overuse in LMICs is largely indirect. Global consumption of antibiotic drugs increased by 36% between 2000 and 2010, with emerging economies such as Brazil, Russia, India, China, and South Africa accounting for 76% of this increase.¹⁰⁰ The extent to which this increase represents overuse is not known, though a 2015 systematic review of medication use in China and Vietnam found evidence for antibiotic overuse in both countries¹³ and a 2005 systematic review¹¹ of patterns of antibiotic use, which included studies from around the globe, found high rates of inappropriate use including substantial patient use of “leftover” antibiotics. Similarly, a 2013 Cochrane review of the effect of interventions to improve antibiotic prescribing for hospitalised patients included studies from both HICs and LMICs, suggesting wide recognition of the problem of inappropriate antibiotic use, though the review did not directly quantify rates.¹⁰¹

In other clinical arenas, unexpectedly high rates of prescribing of specific drugs in individual health systems suggest overuse. Bevacizumab, an expensive and generally ineffective treatment for breast cancer, is not recommended by the National Institute for Health and Care Excellence (NICE) in the UK and its US Food and Drug Administration marketing authorisation for breast cancer was withdrawn. However, the drug is reimbursed by health insurers in Colombia for all (licensed and unlicensed) cancer indications at great expense to the country’s health care system.¹⁰² Similarly, erythropoiesis stimulating agents such as epoetin a and b and darbapoetin have been widely and inappropriately used in Romania to treat ribavirin-induced anaemia in patients with Hepatitis C and organ transplantations in the absence of supporting evidence.¹⁰³

Overuse of screening tests

High rates of inappropriate use of screening tests have been documented, often in the context of concurrent underuse of the test in appropriate populations. In the US, where there is widespread public support for cancer screening,¹⁰⁴ there has been documented overuse of screening for cervical cancer^{105,106} in very low risk women and of mammography in women with limited life expectancy who are unlikely to benefit from diagnosis and treatment.¹⁰⁷ Inappropriate use of screening colonoscopy has been found in both the US and Canada.^{108–110}

Few studies have evaluated rates of inappropriate cancer screening outside of North America. A notable exception is South Korea’s aggressive use of ultrasound screening, which has led to a 15-fold increase in incidence of papillary thyroid cancers. The death rate from this cancer has remained unchanged over the period of increased screening, and it is estimated that 99.7–99.9% of screen-detected thyroid cancers in Korea represent overdiagnosis.¹¹¹ Patients then subjected to unnecessary thyroidectomy face an 11% risk of hypoparathyroidism and 2% risk of vocal cord paralysis, demonstrating clear downstream harms of the inappropriate screening. Despite low levels of appropriate mammography screening and general doubts about the cost-effectiveness of mammograms,¹¹² there are

reports of touring mammography vans in India providing indiscriminate breast cancer screening in women as young as 18 years old,¹¹³ much of which represents clear overuse.

Overuse of diagnostic tests

Overuse of testing appears to be common, driven by availability, apparent objectiveness, and the increasing sensitivity of tests to detect disease. Despite few systematic analyses of inappropriate use of diagnostic tests in general, some specific diagnostic services have been evaluated around the world. Overuse of endoscopy, for instance, appears to be common globally. In primary care practices in Switzerland, 14% of colonoscopy referrals and 49% of referrals for upper endoscopy represented overuse.^{114,115} Elsewhere in Europe, appropriateness rates for endoscopy have been reported in Portugal, Spain, Italy, and Norway, with overuse accounting for between 13% and 33% of tests,^{116–119} and at an Israeli center 16% of endoscopies were unnecessary.¹²⁰ Studies in the US have reported overuse rates as high as 60%.¹²¹ In Saudi Arabia, which has open access to endoscopy, nearly half of procedures were inappropriate.¹²² Interestingly, a Dutch study found that only about a quarter of patients received appropriate colonoscopy after removal of colorectal adenomas, with both overuse and underuse of needed surveillance observed.¹²³

Overuse of therapeutic procedures

Surgery and other invasive procedures are likely to be commonly overused in high-income countries. Though rates of directly-measured overuse were not reported, Elshaug and colleagues identified more than 150 “low-value” services in use in Australia,⁵ and in the US, up to 42% of Medicare beneficiaries were found to have received at least one of 26 low-value treatments, with these low-value interventions accounting for 2.7% of overall Medicare spending.³² Such findings are suggestive of widespread overuse of these services.

There is ample data from around the world on the overuse of several cardiovascular procedures, despite clear and broadly accepted appropriateness criteria.¹²⁴ Inappropriate percutaneous coronary intervention has been documented in many countries, with prevalence of 4–12% in the US;^{55,125} 10%–14% in Germany,^{126,127} 16% in Italy;¹²⁸ 22% in Israel;⁷ 20% in Spain;⁶ and 3.7% in Korea.¹²⁹ In one second-opinion centre in India, 55% of recommended cardiac stents or surgery were deemed inappropriate.⁵⁸

Site of care delivery

The site of care delivery and the intensity of care provided are relevant to overuse since more intense care poses greater risk of complications (and is more costly). If more intense care does not improve outcomes for a condition compared with less invasive or intensive care, it represents overuse. Hospital care has been found to be overused in both HICs and LMICs. A 2000 systematic review¹⁰ of the appropriateness of hospital admissions found widely varying rates of inappropriate hospitalizations around the world, ranging from 1% to 54% of hospitalizations. Rates of overuse of hospital care in specific countries (using established criteria to determine appropriateness) were 18–25% in France,¹³⁰ 33% in Germany,¹³¹ 19% among internal medicine admissions in Portugal,¹³² 7.4% at a referral center in Spain,¹³³ 27% in rural hospitals in China,¹³⁴ and widely variability across three Egyptian hospitals, with rates between 0% and 79%.¹³⁵ In addition, studies have shown wide variations in rates

of hospital use both within and among countries,^{136,137} suggesting possible overuse as well as underuse of hospital care in different locations. Many of these variations are particularly striking with regard to “ambulatory care-sensitive” conditions, or conditions for which high-quality primary care is likely to prevent the need for hospitalization.¹³⁸ Overuse of hospitalization for ambulatory care-sensitive conditions demonstrates that overuse of one (usually more aggressive) service can result from underuse of another, often less aggressive, service.

End of life care

In many countries, evidence exists for the overuse of aggressive care for dying patients and simultaneous underuse of appropriate palliative care. Despite evidence that the majority of people around the world prefer to die at home,^{139–144} about half die in hospital worldwide, with considerable variation among countries.¹⁴⁵ Inappropriately aggressive cancer care near the end of life has been identified as a common problem in Canada,¹⁴⁶ the US,¹⁴⁷ and the UK¹⁴⁸ with regional variations observed.¹⁴⁷ Overuse of aggressive end-of-life care in the UK, for example, has included futile insertion of PEG tubes¹⁴⁹ and administration of chemotherapy that hastens death,¹⁵⁰ while futile ICU care at the end of life has been reported in Canada,¹⁵¹ the US,¹⁵² and Brazil.¹⁵³ A study from Korea found that the majority of terminal cancer patients received futile intravenous nutrition in the last week of life, with discussions of palliation in only 7% of cases.¹⁵⁴

While few systematic assessments of end-of-life care have been performed in LMICs, futile care at the end of life is likely not limited to high-income countries. In one study in India, nearly half of cancer patients were diagnosed late and received futile radiotherapy.¹⁵⁵ In Brazil, one in five cancer patients was taking a useless medication, most often a statin.¹⁵⁶ Overall it is likely that overuse of aggressive care and underuse of palliative care at the end of life is commonplace in both HICs and LMICs.

Harms to patients and health systems

Overuse is likely to harm patients physically, psychologically and financially, and could threaten the viability of health systems by driving up costs and diverting resources. However, our ability to collect strong evidence describing the direct consequences of overuse on patients and health systems has been impeded by the same factors that challenge our ability to document overuse itself, including an incomplete evidence base for effectiveness and little reporting of harms from treatments.¹⁵⁷ Much of what we know about harms of overuse derives from estimates and extrapolations.

Harms to patients

There are few studies directly documenting patient harms from overuse, though some estimates of the rate of physical harm to patients from overuse can be inferred from data on adverse events and studies of overuse of specific treatments. For example, Cushner et. al used outcomes from a global orthopaedic registry for total knee and hip arthroplasty to estimate a rate of 7–8% for serious adverse events (including severe infection, revision, cardiovascular events and death).¹⁵⁸ Other researchers estimate that more than 20% of total

knee replacements in Spain and 30% in the US are inappropriate.^{50,159} Thus we can estimate that 2–3% of patients undergoing arthroplastic surgery in those two countries are unnecessarily harmed by an inappropriate procedure, with approximately 14,000 patients suffering harm from unnecessary knee and hip arthroplasty per year in the US alone. Other examples of documented harm from overuse include high rates of overuse of implantable vena cava filters and low rates of appropriate removal,¹⁶⁰ with known excess venous thrombotic complications in 10% of patients who receive them;¹⁶¹ and continued overuse of tight glycemic control in the intensive care unit despite evidence of higher rates of hypoglycemic complications without reductions in mortality.¹⁶²

Psychological harms from overuse have been documented for few clinical situations but may be common. Several authors have noted that hospitalized patients may be physically isolated unnecessarily,¹⁶³ with negative consequences including loneliness, feelings of stigmatization, and depression.¹⁶⁴ Screening for breast cancer is known to lead to diagnosis of precancerous lesions such as ductal carcinoma in situ,¹⁶⁵ which has been associated with anxiety for several years after the diagnosis and patient overestimation of future cancer risk.^{166–168}

Patients can also suffer from being inappropriately labeled as “ill” as a result of unnecessary testing. As early as 1967, Bergman and Stamm found that among adolescents with heart murmurs which had been previously (and possibly unnecessarily) evaluated and deemed “innocent,” 40% continued to be subjected to restricted activity and 63% had parents who continued to believe their child to be unhealthy.¹⁶⁹ Harm from labeling can also occur in the context of mental illness. For example, ADHD is widely acknowledged to be overdiagnosed and overtreated in the US and other HICs, and is also overtreated in some LMICs¹⁷⁰ (even as some children with ADHD fail to receive appropriate treatment). There is scant research on the impact of an ADHD diagnosis on childrens’ sense of self-esteem and ability to modulate their own behavior, but the label has been shown to impact teacher expectations and peer interactions, which can substantially influence children’s self-perceptions.^{171–173}

Financial costs represent a potentially important but poorly documented source of harm from overuse to patients. In the US, cost has been framed as a known consequence of all medical care¹⁷⁴ and of cancer treatment in particular,¹⁷⁵ with medical bills contributing to over half of personal bankruptcies,¹⁷⁶ although the contribution of overuse is not known. Similarly, in Australia, parents of children with cancer reported high out of pocket expenses,¹⁷⁷ and the World Health Organization has decried “medical indebtedness” across the globe. Health care is a major source of impoverishment and indebtedness among the poor of India^{178,179} and 15% of rural Vietnamese families with one member with a chronic illness experience financial catastrophe.¹⁸⁰ Determining the financial burden of overuse on patients requires active investigation in the future.

Harms to health care systems

While there are few direct measurements of the proportion of health care spending attributable to overuse, evidence is emerging to suggest the cost may be considerable. A study of inappropriate use of bone scans for US Medicare beneficiaries with prostate cancer found that 21% and 48% of patients at low and moderate risk of bony metastases underwent

at least one scan, despite recommendations against scanning in these groups, at a cost of \$11,300,000 annually.¹⁸¹ High rates of overuse are estimated by experts to contribute substantially to health care spending in the US (and to its mediocre quality);¹⁸² based on a conservative estimate, the US spent at least \$270 billion on overuse in 2013² (even as millions of Americans lack adequate access to basic health care). Overuse may also strain health care budgets in other countries.¹⁸³ In Australia, where many common services are believed to be overused,⁵ the growth in health care expenditure from the rising volume of medical services has been identified as the greatest threat to the financial position of the government, and a bigger cause of health cost increases than population growth or ageing.¹⁸⁴

Of particular concern is the potential financial impact of overuse on LMICs. The use of expensive advanced technology in HICs, such as new cancer biologics, imaging devices, and multi-focal cataract replacement lenses, spreads through globalized markets to LMICs, potentially crowding out less technological (and potentially higher value) means of promoting population health.¹⁸⁵ In India, for example, private health insurance and formal sector employees' insurance programs cover expensive cancer drugs for a tenth of the country's population, even as the general population does not have access to many basic health interventions.¹⁷⁸ While the extent to which the use of expensive services represents true overuse as opposed to lower-value care from a public health perspective is not clear, overuse is a potential threat both to the viability of public budgets and to population health in LMICs.

Worldwide trends in overuse

Is overuse getting better or worse? It is a difficult question to answer for a number of reasons. First, we are only beginning to conceptualize overuse as a general system problem and to develop system-level metrics.¹⁸⁶ There are no measures in general use. Second, health care systems are complex and dynamic;¹⁸⁷ reducing or eliminating overuse of one service or in one site of care can encourage overuse in another.

We do know that there has been increased attention among health ministers, clinicians, policy makers and the public to overuse during the last 5 to 10 years, particularly in HICs but also in some LMICs. However, awareness of the problem has not automatically led clinicians to deliver the right care. In the US, for example, concerns about caesarean delivery rates have existed for decades but rates continued to rise (from 21% in 1996 to 31% in 2006¹⁸⁸). Despite longstanding concerns about overuse of imaging with CT and MRI, their use has increased by 8% to 10% annually between 1996 and 2010.¹⁸⁹

In LMICs, overuse appears to be on the rise, at least for certain services. For example, rates of caesarean delivery rose from 19% to 49% among low-risk deliveries in Tanzania between 2000 and 2011,¹⁹⁰ with rates also rising over time in India, Nepal, and Bangladesh.¹⁹¹ Financial incentives and government policies can contribute to dramatic overuse. In China, government cuts in subsidies led hospitals to charge patients for care,^{192,193} potentially contributing to notably high rates of cesarean delivery (46% in one study in a rural area).¹⁹⁴ Amid allegations of frank physician corruption and kickbacks from the pharmaceutical

industry and diagnostic centres, there are reports from India of inappropriate use of drugs, diagnostic tests and procedures,¹⁹⁵ including strikingly high rates of hysterectomies.¹⁹⁶ These trends appear to be recent and likely reflect increases in overuse over the last decade, but there are few data documenting longitudinal changes.

Wealthy countries are experimenting with specific initiatives to address overuse, such as NICE's "do not do" list,¹⁹⁷ attention to low-value practices in Australia,⁵ and the Choosing Wisely® campaign,¹⁹⁸ but there are few studies in either HICs or LMICs addressing the impact of such initiatives. Additionally, EHRs have been used as tools to reduce overuse locally¹⁹⁹ and could be employed more broadly in the future. The last paper in this series, "Levers for Addressing Medical Underuse and Overuse: Achieving High-Value Health Care," reviews efforts around the world to reduce overuse.

Conclusion

There is strong evidence of widespread overuse of several specific services in multiple countries, suggesting that overuse is common around the world and may be growing. However, this paper highlights a key challenge: measuring overuse and developing robust evidence for its prevalence in health services and patient populations. There is a clear need for a research agenda to develop that evidence.¹⁴ Given that overuse likely causes harm to both patients and health systems, physicians, politicians and policy-makers in both HICs and LMICs must understand overuse and act to reduce it.

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Key Messages

1. Overuse is difficult to measure and has not been well characterized.
2. Most studies of overuse come from high-income countries, but there is growing evidence that overuse is a global problem.
3. Overuse likely causes patients physical, psychological and financial harm.
4. Overuse deflects resources from public health and other social spending in both poor and wealthy countries.
5. Overuse occurs across a wide range of medical specialties.

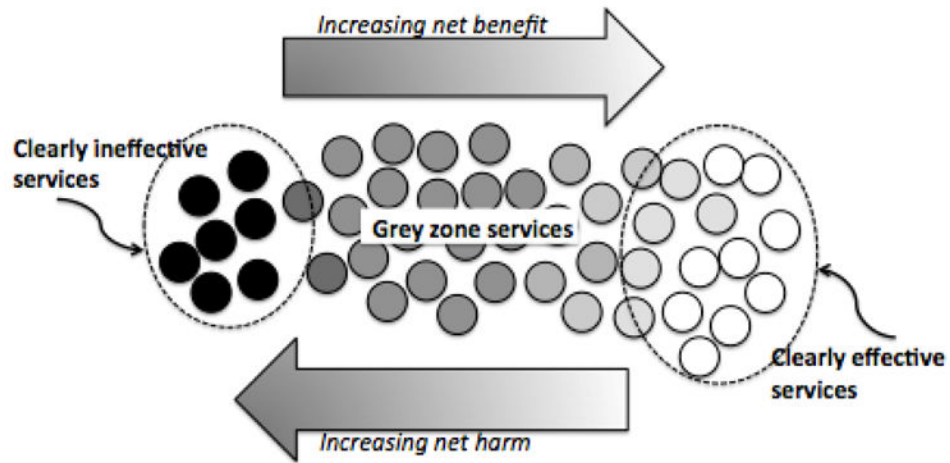


Figure 1. Grey Zone Services

Some medical tests and treatments are of clear benefit, and some are clearly ineffective and therefore offer only net harm. There is clear underuse of effective services, and clear overuse of ineffective services. Many services fall into a more nebulous grey zone, where evidence is lacking, or the services is delivered to inappropriate patients, or to patients who are poorly informed.

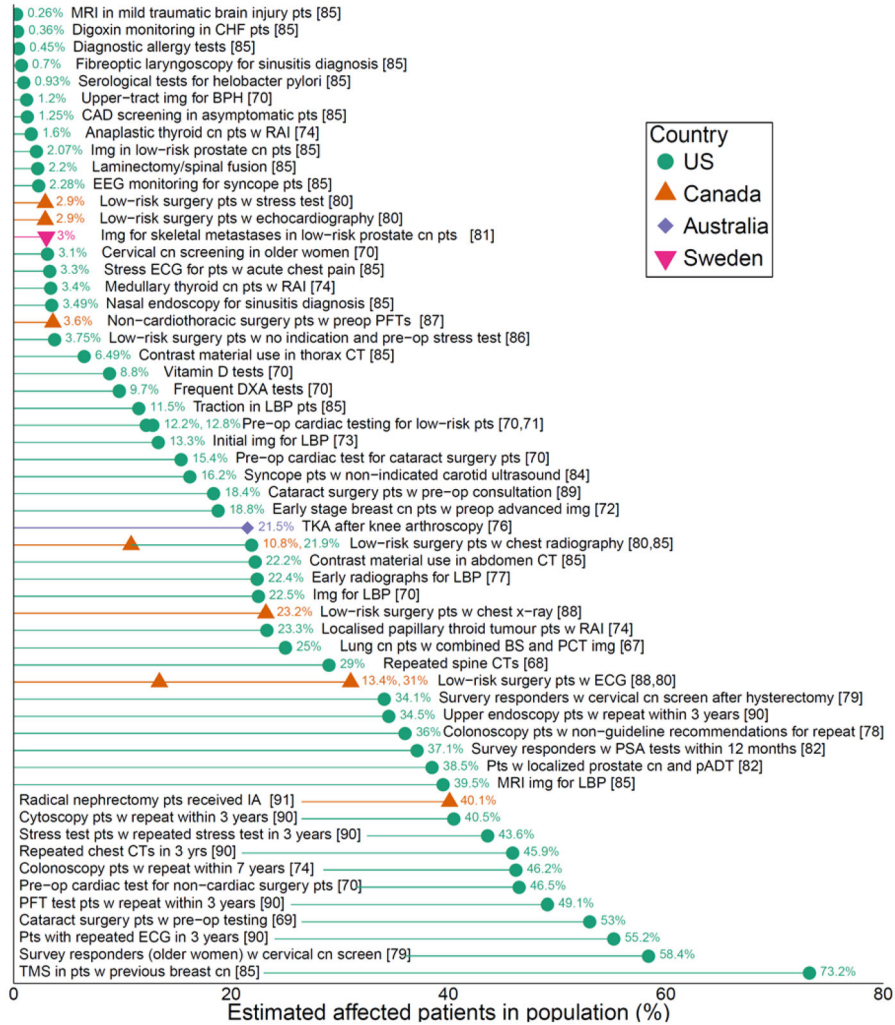


Figure 2. Overuse of Selected Services in Four Countries

Figure 2 explanatory note: Estimates from the literature of the proportion of patients that received various low-value services, out of the relevant patient population. The populations are based in four locations (US: circle/green, Canada: triangle/orange, Australia: diamond/purple, Sweden: upside-down triangle/pink). Abbreviations: Patients (pts); with (w); cancer (cn); imaging (img); preoperative (preop); total knee arthroplasty (TKA); lower back pain (LBP); computed tomography (CT); benign prostate hyperplasia (BPH); primary androgen deprivation therapy (pADT); bone scintigraphy (BS); positron emission tomography (PET); tumour marking studies (TMS); dual-energy x-ray absorptiometry (DXA); echocardiography (ECG); pulmonary function test (PFT); ipsilateral adrenalectomy (IA); radioactive iodine treatment (RAI); carotid artery disease (CAD); congestive heart failure (CHF); magnetic resonance imaging (MRI). Figure adapted and updated from Chalmers and Elshaug.⁴

Table 1

Direct and Indirect Evidence of Overuse Globally

Clinical Category	Direct documentation of inappropriate care	Indirect evidence
Musculoskeletal procedures	<p>Spain: Rates of inappropriate total knee replacement of 26% and of total hip replacement 25%⁴⁹</p> <p>US: Rate of inappropriate total knee replacement 34%⁵⁰</p>	<p>International: 4-fold variation across countries and 2–3 fold variation within countries in rates of knee replacement⁵¹</p> <p>England: 13-fold regional variation in rates of arthroscopic knee lavage⁵²</p> <p>US: 5-fold regional variation in adjusted rates of total hip and knee replacement⁵³</p>
Cardiovascular procedures	<p>Italy: Rate of inappropriate percutaneous coronary intervention (PCI) 22% and of inappropriate coronary angiography 30%⁵⁴</p> <p>US: Rate of inappropriate PCI 1.1% for acute indications and 11.6% for non-acute indications with variation across hospitals (6.0%–16.7%)⁵⁵</p> <p>Brazil: rate of inappropriate coronary angiography 20%⁵⁶</p>	<p>International 9-fold variation in use of PCI and 5-fold variation in use of CABG across OECD countries²⁸</p> <p>US: Rates of elective percutaneous coronary interventions vary 10-fold within the state of California⁵⁷</p> <p>India: A second opinion centre reported recommending against cardiac interventions in 55% of patients in whom intervention initially recommended⁵⁸</p>
Hysterectomy	<p>Taiwan⁵⁹: 20% of hysterectomies inappropriate</p> <p>Switzerland⁶⁰: 13% of hysterectomies inappropriate</p> <p>US⁶¹: rates of inappropriate hysterectomies between 16% and 70% across studies</p>	<p>Canada⁶²: 2.7-fold variation in rates of hysterectomy across regions within Ontario</p> <p>Netherlands⁶³: 2.2-fold regional variation in rates of hysterectomy of bleeding; 2.3-fold regional variation in rates for pelvic organ prolapse</p> <p>India⁶⁴: prevalence of up to 9.8% overall, with 1/3 of hysterectomies performed in women under age 35 (likely inappropriate in this age group)</p>
Antibiotics for acute diarrhea	<p>Italy⁶⁵: among children hospitalized for acute diarrhea, 9% received antibiotics inappropriately</p> <p>China⁶⁶: 57% received antibiotics inappropriately; among those with an indication for antibiotics, 21% were NOT treated (adults)</p> <p>Thailand⁶⁷: 55% of children with acute diarrhea received antibiotics inappropriately</p>	<p>US⁶⁸: 10.4% of patients with diarrhea received antibiotics (often likely inappropriate)</p> <p>India⁶⁹: 71% of children with acute diarrhea received antibiotics (despite recommendation against routine use)</p> <p>India⁷⁰: Rates of antibiotic use for acute diarrhea 43% in public facilities and 69% in private facilities (despite recommendation against routine use)</p>