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Sustainable Medicines Partnership

Every Dose Used

Reducing Wasted Medicines Playbook

MAKING AN IMPACT THAT MATTERS since 1845

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Foreward

Welcome to our report on a pervasive global healthcare problem: wasted medicines. Annually, an estimated 4.5 trillion medicines are manufactured, but billions never reach the patients who need them[1].

This colossal waste is not just a tragic missed opportunity to help millions of people in need, it is a huge waste of financial and planetary resources and makes a sizeable contribution to environmental pollution. Most importantly, with focus and commitment, much of the waste could potentially be avoided.

The Sustainable Medicines Partnership (SMP) is a diverse action collaborative of 48 organizations united by a common goal: to reduce the waste of medicines and from medicines[2]. Our membership spans across the healthcare ecosystem, including leading pharma, generic and retail medicine manufacturers, distributors, healthcare providers, technology innovators, researchers, and policy makers. Together, we are executing a program to develop and pilot science-based, scalable solutions that make medicines more sustainable and equitable.

This playbook, a culmination of three years collaborative effort, embodies our action-orientated ethos and commitment to driving systemic change, through developing and disseminating practical solutions.

I am deeply grateful to all the SMP members who have contributed their expertise, insights, and unwavering dedication to this initiative. Your collective efforts were central to shaping the strategies and solutions outlined in this report. I also want to thank, in advance, every reader of this report. Your interest and willingness to act will transform these solutions from ideas into impactful realities, that will improve patient access to medicines, decrease healthcare costs, and reduce environmental harms.

The time for action is now. Together, we can turn the challenges into opportunities, fostering a more efficient, equitable, environmentally responsible global healthcare ecosystem that supports healthier people and a healthier planet.

Nazneen Rahman

Director, Sustainable Medicines Partnership

Founder and CEO, YewMaker

Executive Summary

The global healthcare industry is committed to ensuring a consistent supply of medicines to as many patients as possible, with patient health as the paramount priority across manufacturers, distributors, providers, prescribers, regulatory agencies, governments, and all others in the healthcare ecosystem.

One challenge many organizations face is managing the balance between maintaining necessary surplus stocks for seamless patient access and minimizing waste to enhance healthcare efficiency, medicine availability, and environmental sustainability.

An illustrative example of the scale of wasted medicines is the estimated $11 billion of excess inventory that major pharmaceutical companies destroy each year[3]. While substantial, this represents only a fraction of the total waste, highlighting an ecosystem ripe with opportunities for improvement.

This report, developed in collaboration with diverse stakeholders from the Sustainable Medicines Partnership, explores the complex drivers underlying this pervasive problem and presents actionable solutions to reduce wasted medicines across the healthcare ecosystem.

Key Insights

Balancing Surplus and Waste: There is a need for a nuanced approach to striking a balance between maintaining necessary surplus stocks and minimizing waste, to ensure patient access while enhancing healthcare efficiency and sustainability.

Drivers of Wasted Medicines: There are nine key drivers of waste occurring between manufacturer product release and patient receipt, including regulatory barriers, poor demand forecasting, packaging inefficiencies and misaligned incentives, among several others.

Solutions to Reduce Wasted Medicines: This report presents a “playbook” of solutions that range from immediate actions that organizations can implement more independently, such as improving inventory and demand forecasting, to longer-term and more collaborative solutions that address ecosystem data transparency and surplus medicine reallocation barriers.

Practical Guide for Action: A step-by-step guide can help organizations initiate actions to reduce wasted medicines, starting with acknowledging the challenges and opportunities they face. A key first step is measuring current levels of wasted medicines as a baseline from which to investigate root causes, prioritize solutions, set targets, and monitor progress.

Benefits of Reducing Wasted Medicines: There are multidimensional benefits of reducing wasted medicines, including better patient care through increased medicine availability, better organizational performance through cost savings and operational efficiencies, and better environmental stewardship through reduced medicine and packaging pollution.

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Introduction

Medicines are foundational to our global healthcare ecosystem, providing essential treatments to improve and maintain health and wellbeing.

Medicines are developed and approved through rigorous processes, and then manufactured and distributed through a complex supply chain, with meticulous attention to product integrity, safety, and quality. Ultimately medicines reach patients, either directly or after being prescribed by healthcare professionals. Given the criticality of medicines, it is essential the manufacture, distribution, and supply ecosystem are robust, resilient, secure, safe, fast, and efficient.

To provide seamless, uninterrupted patient access to medicines it is necessary to maintain a surplus. This approach, while crucial for avoiding shortages, can result in some products being wasted. Optimizing the balance between surplus and wasted medicines is one way to maximize patient access and minimize shortages; moreover, it has potential to deliver cost savings, operational efficiencies, and reduce negative planetary harms caused by wasted medicines (and their packaging) polluting the environment.

Billions of medicines are being wasted globally every year due to the complexity of the supply chain and a default approach that greatly favors maintaining surplus over reducing waste[4]. This conservative strategy is intended to safeguard against shortages, but frequently leads to avoidable waste that not only negatively impacts patients, the planet, and business performance, but can inadvertently exacerbate shortages.

The aim of this report is to provide actionable guidance to organizations within the healthcare ecosystem to reduce wasted medicines effectively. Chapter 1 defines the scope of wasted medicines addressed in the report and highlights how reducing wasted medicines can provide benefits to stakeholders within and beyond healthcare. Chapter 2 identifies nine leading drivers of wasted medicines derived from Deloitte interviews with SMP collaborators, extensive YewMaker and Deloitte secondary research, and deep Deloitte experience from serving clients across the entire healthcare ecosystem.

Chapter 3 outlines potential solutions to reduce wasted medicines, detailing strategies that organizations can adopt independently and those that require collaboration with other stakeholders. Chapter 4 offers a practical guide to help organizations start reducing wasted medicines, including steps to understand their role, measure waste, and prioritize actions based on their specific context and capabilities. The report concludes with a call to action for all healthcare stakeholders to initiate actions to reduce wasted medicines, to enhance patient care, operational efficiency, and environmental sustainability.

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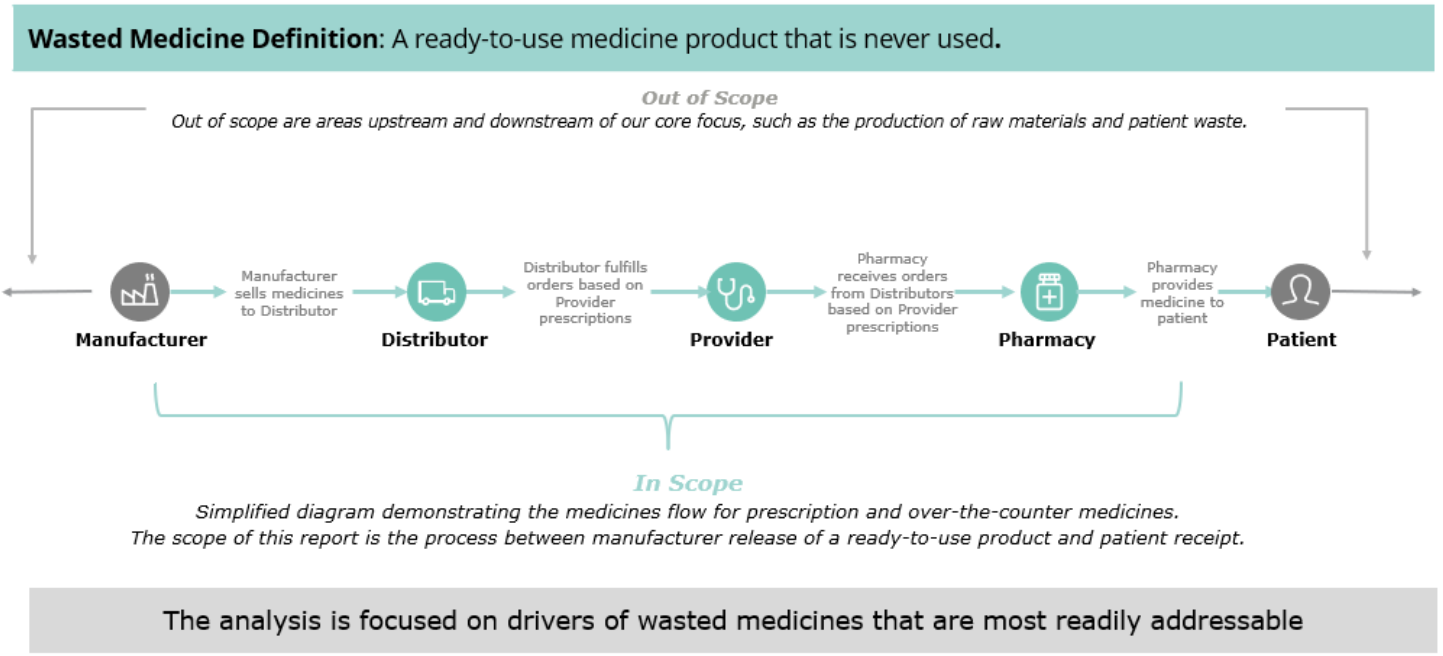
Chapter 1: What is the problem and why does it matter?

Wasted medicines, for the purposes of this report, are defined as “ready-to-use medicine products that are never used”.

Figure 1 below depicts a simplified visualization of the medicines supply chain. Manufacturers produce medicines that are needed (after extensive development and testing, not depicted here) and typically sell those products to a distributor. Distributors distribute the medicines by fulfilling orders placed by Pharmacies and Providers. The Pharmacies and Providers then provide the medicines to the Patient. To note, Providers is inclusive of hospitals, clinics, and other health centers where medicines are distributed, and we are using ‘Patient’ to include consumers of prescribed and ‘over-the-counter’ medicines (medicines, such as painkillers, that can be purchased without a prescription). Figure 1 demonstrates the high-level medicines flow for prescription and over-the-counter medicines. The scope of this report covers the processes between manufacturer release of a ready-to-use product and patient receipt. There are other areas in the development and use of medicines, such as the production of raw materials and disposal in people’s homes, but these are considered out of scope for this report.

Figure 1:



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Addressing wasted medicines can provide benefits both directly within the healthcare ecosystem and to stakeholders more indirectly impacted. There are myriad advantages that can result from reducing wasted medicines, with three primary categories comprising most of the benefits; reducing wasted medicines can improve patient supply, reduce ecosystem costs, and reduce harms to the environment. Figure 2 depicts these three categories:

Patients

- Wasted medicines reduce the opportunities for the right patient to receive the right medicine at the right time.
- Medicines nearing their expiry date are often not sold and are destroyed, reducing patient availability.

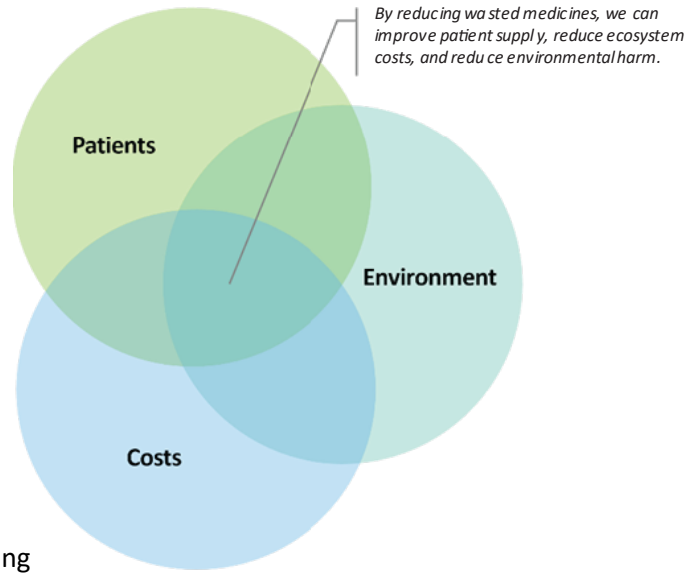
Costs

- Wasted medicines carry the costs associated with producing more than used.
- Inventory costs of storing excess medicines could be reduced if fewer medicines were wasted.
- Costs associated with the safe disposal of unused medicines could also be reduced if fewer medicines were wasted.

Environment

- Wasted medicines create emissions associated with the production, distribution, and disposal of those products.
- Wasted medicines also result in extra paper and plastic packaging waste, damaging to the environment.

Figure 2:



The benefits of reducing wasted medicines primarily manifest into these three categories, though other benefits may well exist. Each category is critically important to the sustainability of our healthcare ecosystem, our societies, and our planet. Many benefits fit into more than one category, and the power of multiple benefits is amplified when they exist at the intersection categories. For example, improved inventory management capabilities could: (1) reduce the amount of medicines that expire in the warehouse through improved visibility and first-expiry-first-out (FEFO) picking, thereby helping patients gain access to these medicines that would otherwise be thrown away if past expiry; (2) reduce the cost of wasted inventory and costs to destroy and dispose of expired products; (3) reduce the amount of plastic and paper packaging that is wasted when products past expiry must be discarded. This win-win-win scenario is not an isolated example; many of the benefits highlighted in Chapter 3 manifest in multiple of these categories.

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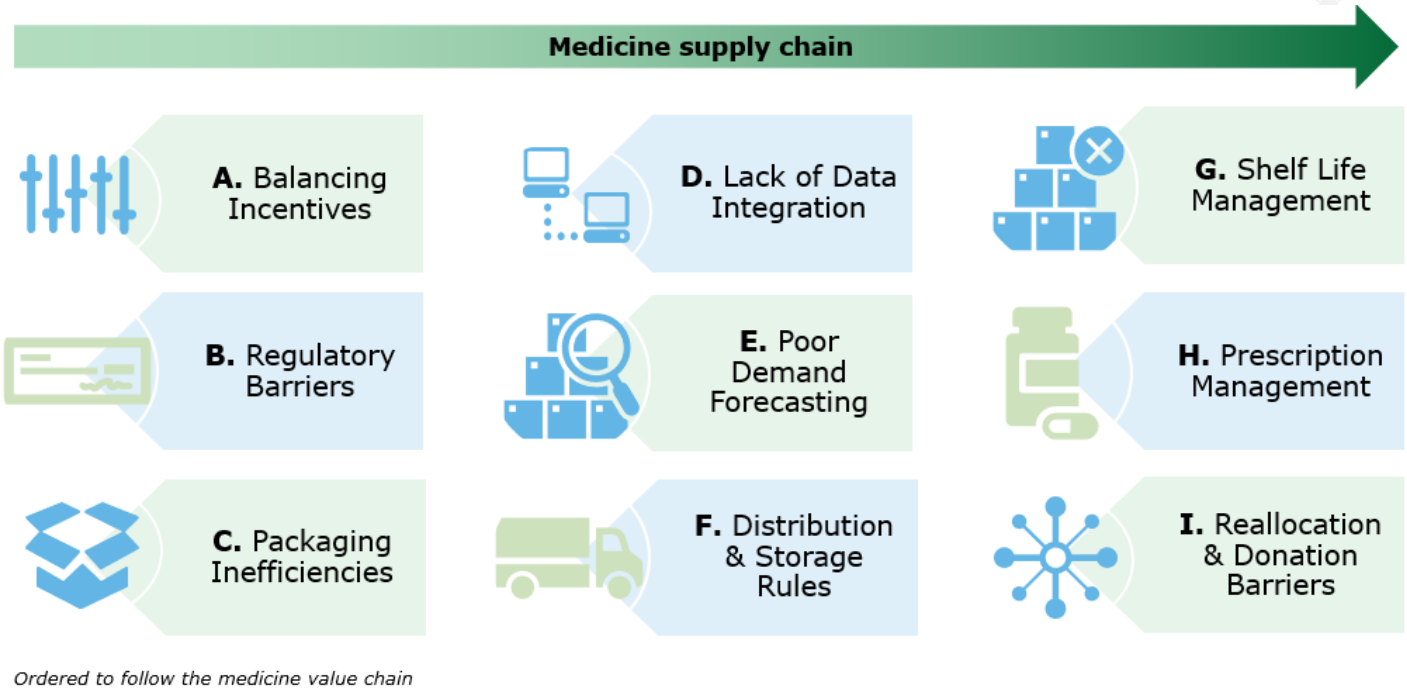
Chapter 2: Why and where is waste happening?

Before being able to address how to reduce wasted medicines most effectively, the drivers of wasted medicines should first be explored.

Based on interviews conducted with SMP stakeholders in the healthcare ecosystem, Deloitte industry experience, and extensive secondary research by Deloitte and YewMaker, nine key drivers emerged. These drivers are discussed below in general order of the medicines supply chain beginning upstream and working towards downstream drivers. Figure 3 provides a visual framing for the discussion on leading drivers of wasted medicines.

Figure 3:



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Driver A: Balancing Incentives

Across the healthcare ecosystem, a delicate balance must be maintained between ensuring a ready supply of medicines with the reduction of wasted medicines, to maximize the total availability and accessibility of medicines to meet patient needs. This balance requires optimization of the entire supply chain. Challenges include:

- **Prioritization strategies:** Ensuring patient access through maintaining high stock levels is paramount, while potential opportunities to reduce wasted medicines are generally a secondary consideration.
- **Stockout prevention:** Organizations aim to prevent stockouts, which can damage patient access and brand image, but this often leads to overstocking and subsequent waste.
- **Lack of measurement:** Most organizations are not measuring wasted medicines, making it difficult to optimize the balance between maintaining supply and reducing waste.
- **Anticipating shortages:** Real or perceived medicines shortages can contribute to stockpiling behaviors that drive shortages and waste – e.g., COVID tests in the 2020 pandemic.

The complex healthcare ecosystem is motivated by incentives that foster certain behaviors. The potential misalignment within and between stakeholders can be a driver of waste.

- **End-to-End:** Several incentives across the supply chain contribute to wasted medicines such as:
  - Each node of the supply chain has minimum shelf life requirements for medicines, which can lead to waste of medicines with not enough "saleable time"[5].
  - There is no formal government or regulatory requirement to report on wasted medicines, and sustainability reports do not typically incorporate this as a standard metric[6].
  - There are typically no formal penalties for wasting medicines.

- **Manufacturer:** Manufacturers have an incentive to drive higher levels of production. For example, manufacturers typically prioritize maintaining supply of medicines over reducing waste caused by overproduction.
- **Distributor**: Distributors have varying processes globally on accepting downstream returns – accepting returns of expired medicines from Providers and Pharmacies limits the disincentive of "over-ordering", which can lead to wasted medicines[7].
- **Pharmacy:** Pharmacies often have contracts to receive substantial rebates on returns, which limits the disincentive to over-order.
- **Provider:** With the rising popularity of online ratings and reviews, some Providers are rated based on patient satisfaction and often patients want a "quick fix" when feeling sick, which mounts pressure on Providers to prescribe medicines when potentially not necessary[8].

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Driver B: Regulatory Barriers

Regulators and governments, with the primary objective of safeguarding patients, establish the boundaries and guidelines for how medicines are produced, sold, distributed, and used. These boundaries, can sometimes, inadvertently, cause challenges to waste reduction. Regulatory and governmental barriers that can lead to waste include:

- **Limited focus on waste reduction:** Environmental protection regulations today are primarily focused on the reduction of greenhouse gas emissions and the safe destruction of dangerous chemicals, with limited focus on wasted medicines as a Key Performance Indicator (KPI) for sustainability. Corporate Sustainability Reporting Directive (CSRD) serves as a prime example[9].
- **Stock keeping requirements:** Many governments maintain a safety-stock of key medicines to mitigate the impact of shortages, but in the absence of a market shortage, large amounts may expire and become wasted[10].
- **Organizational structures:** Most countries have a disaggregated structure for healthcare stakeholders, such as pharmacies and hospitals (they operate as separate entities rather than a singular organization). This model can lead to less clear supply and demand signals and limited visibility to reallocation opportunities across the network.
- **Competition laws:** Anti-trust laws designed to protect patients from collusion can restrict collaboration and data sharing that could reduce waste.
- **Geographical barriers:** Medicines sometimes face delays at borders due to cross-border requirements, which can lead to waste if they are held for significant periods of time.
- **Language requirements:** To ensure patient accessibility of medicine information, products are often required to have packaging with language-specific instructions, increasing product complexity and reducing reallocation and donation opportunities.

To illuminate the challenge with a specific example, the United Kingdom National Health Service (representing public hospitals) maintains that bidders for tenders must have 6 months of supply in stock within the country[11]. If a bidder is unsuccessful, that stock is typically wasted. Additionally, all medicines must maintain a 6-month shelf life, or it is wasted or sent back to wholesalers. These requirements can drive waste of medicines that could be used by patients in need.

Driver C: Packaging Inefficiencies

- Packaging plays a role in the quantity of medicines that are wasted. The impacts of packaging in driving waste can be illustrated by three examples: (1) vials, (2) blister packs, (3) cold chain.
- **Vials:** Manufacturers generally set vial sizes according to average use, which can lead to waste (e.g., for drugs dosed based on patient body size, vials can be up to 33% larger than needed, with the excess wasted once the vial is opened)[12,13].
- **Blister Packs:** Manufacturers often use packaging that could be reduced in size and quantity. There are also opportunities to reduce the number of excess pills in bottles and blister packs[14].
- **Cold Chain:** Medicines that require cold chain distribution and handling often need specialized packaging to ensure product safety and integrity. Each year, medicines worth $35 billion are lost due to failures in cold chain logistics[15]. Opportunities exist to optimize the quantity, composition, and reusability of packaging to ensure product efficacy and minimize waste.

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Driver D: Lack of Data Integration

Throughout the ecosystem, there is a lack of data integration among stakeholders. Each stakeholder has visibility to the demand signal being sent from their immediate downstream stakeholder, but typically lack the true demand signal coming from the end customer, and this can be distorted as the demand signal is sent upstream through what is known as the "bullwhip effect". This phenomenon is when demand signals increase in variability as it moves upstream.

Lack of data integration can result from organizations wanting to keep downstream sales and upstream purchase information confidential, to maintain competitive advantage. The diversity of technologies used for procurement complicates technology integration among stakeholders and lack of collaborative planning is a further driver. Some organizations are exploring joint business planning with key suppliers and customers, to align supply and demand, and reduce both overproduction and underproduction, which can help reduce waste.

Driver E: Poor Demand Forecasting

Many organizations struggle with poor demand forecasting, which can impact both business performance and wastage. The business performance implications of demand forecasting challenges are well known but impacts on wasted medicines are less explored. There are four primary impacts of poor demand forecasting on wasted medicines. First, it can result in overproduction of medicines and increased downstream waste. Second, underproduction of medicines can lead to shortages which drive stockpiling behavior and distortion of the true demand signal. Third, static forecasting can lead to an unresponsive supply chain that reacts to outdated demand signal information. Finally, lack of focus on expiry dates can lead to medicines exceeding the saleable timeframe before being distributed, contributing to waste.

Improved demand forecasting not only has potential to reduce wasted medicines it is also good for business. Below are a few examples illustrating how these advantages can materialize across three key areas, creating a win-win scenario:

- **Revenue:** Provide "the right product" more often and expedite sales upon launches.
- **Cost:** Reduce waste of expired or excess medicines and reduce overtime costs due to unplanned production.
- **Inventory:** Reduce buildup of excessive inventory for slow product launches and uncertain tenders.

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Driver F: Distribution and Storage Rules

Each stakeholder in this report contributes to wasted medicines due to the distribution and storage rules they enforce. While these rules are designed to maintain product integrity, they can also, inadvertently drive waste as outlined below.

MANUFACTURERS

Manufacturers set the guidance for how the medicines they make should be handled and stored, not just in their own operations, but by all downstream stakeholders. Manufacturers may unintentionally drive waste as they optimize manufacturing, packaging, and distribution of medicines from their own perspective rather than for the broader ecosystem. Additionally, the lack of accountability or incentives for wasted medicines reduction when setting the guidance can contribute to avoidable waste.

DISTRIBUTORS

Distributors manage large volumes of medicines at high velocity to ensure timely, accurate medicines distribution to downstream stakeholders. Challenges are increasing as distribution networks adapt to demand for localized networks and tighter delivery schedules, particularly for advanced therapies with specific conditions (e.g., CAR-T) or medicines requiring cold chain logistics. Additionally, recent market disruptions (e.g., global conflicts) have increased the necessity to hold excess inventory, which increases the likelihood of waste[16].

PROVIDERS AND PHARMACIES

Providers and Pharmacies also manage the inventory of medicines (albeit at lower volumes than Distributors) and the disbursement of medicines to Patients. Stricter storage requirements (e.g., for cold chain medicines) can be challenging and costly, particularly for smaller storage spaces. Disposal of uncollected medicines also increases waste.

Driver G: Shelf Life Management

Immature inventory and expiry management capabilities are another driver of wasted medicines across the healthcare ecosystem. Many medicines have months or years of shelf life, so expiry should not necessarily be a large driver of waste. However, poor planning and lagging inventory management practices have resulted in sub-optimal processes in many organizations[17].

The FEFO (first expired, first out) approach is considered best practice for managing inventories with expiry dates. However, outdated processes and technologies are preventing many healthcare organizations from fully adopting this strategy. Additionally, expiry dates for medicines are typically driven by regulatory approval timelines and commercial considerations, rather than by the actual product stability. There is evidence showing that many medicines remain safe and effective well beyond their labeled expiry date, suggesting opportunities to extend the expiry on many products[18]. For example, research has shown that 90% of medicines are safe and effective for 5 years longer than their stated expiry date[19].

While extending the shelf life of a product may conflict with incentives to drive profitability (i.e., longer shelf life may drive lower sales), the potential overall cost benefits of more efficient expiry management are significant. For example, the U.S. Department of Defense's $3.1M investment in the FDA's shelf life extension program, averted the need to replace $2.1B worth of expired drugs in 2016 alone[20]. Expanding stability testing to extend shelf life to more medicines and more markets could lead to substantial reductions in cost and wasted medicines.

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Driver H: Prescription Management

The process of managing prescriptions from Prescriber to Pharmacy to Patient can drive wasted medicines when relevant information is not consistent or transparent among all stakeholders. Data management is a delicate balance of transferring critical information, often including personal health information, to other stakeholders in a timely, accurate, and secure manner. Any errors, misinterpretations, or delays in information exchange can not only lead to wasted medicines, it may also adversely affect patient care.

Wasted medicines can occur if essential information is either missing or misunderstood among healthcare stakeholders, leading to situations such as:

- Prescribing incorrect or unnecessary medicines that are wasted when the prescription is corrected[21].
- Providing excess medicines that are wasted (or worse, consumed unnecessarily) for example, not stopping repeat prescriptions that are no longer required[22].

Driver I: Reallocation and Donation Barriers

Excess medicines can occur for several reasons, including overproduction, over procurement or misallocation. Reallocation of surplus medicines between Pharmacies and Providers offers a pragmatic solution to minimize waste by shifting the excess from one stakeholder to another who has a deficit. While this works well in principle, in practice it is a difficult and cumbersome process due to systemic barriers, including the absence of accountable entities responsible for overseeing reallocation, limited cross-sector collaboration, and a lack of effective tools to manage the logistics of medicine reallocation.

International reallocation introduces additional layers of complexity and requires extensive collaboration to navigate diverse international laws, language requirements, and pricing structures.

Donating excess medicines from regions with a surplus to those with a deficit is another avenue to mitigate waste and increase equity of access to healthcare. However, this well-intentioned strategy also faces many challenges. First, large-scale medicine donations can disturb local markets, potentially discouraging regular imports and distorting market dynamics. Second, inadequate medicine storage and distribution infrastructure in the recipient country may impede delivery of medicines in the right condition, to the right person, at the right time. Moreover, if donations fail to reach patients, they pose environmental and health risks, particularly if they are not disposed of appropriately[23]. This could negate the intended benefits of improving access and would merely relocate, rather than reduce, waste.

These barriers highlight the need for strategic, coordinated approaches to overcome logistical, regulatory, and infrastructural challenges in medicine reallocation and donation.

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Chapter 3: What are the potential solutions?

By considering emerging and leading practices within healthcare ecosystems and drawing inspiration from outside healthcare, we identify several potential solutions that can address the drivers of wasted medicines outlined in Chapter 2.

These solutions are presented in an order reflecting the level of stakeholder collaboration required, starting with solutions that organizations can implement relatively independently and progressing to solutions that require greater coordination and cooperation with other stakeholders. It should be noted that not all solutions are created equal. Some solutions are more impactful to reducing wasted medicines than others and some may require more investment or change management. After outlining each potential solution, a framework is provided in Chapter 4 to assist organizations in effectively mobilizing for success and to select and prioritize the most appropriate solutions for their specific circumstances.

Potential solutions

For each potential solution, there is an estimation of the level of collaboration required, a short description, assignment of stakeholder roles, and discussion of implementation considerations for those contemplating their role in delivering the solution. Stakeholders listed as “Primary Drivers” play an active role in driving the solution, while “Secondary Drivers” take action that supports the solution. Some stakeholders are not drivers but are considered “Impacted”, meaning they play no significant role in delivering the solution but are impacted by its outcomes.

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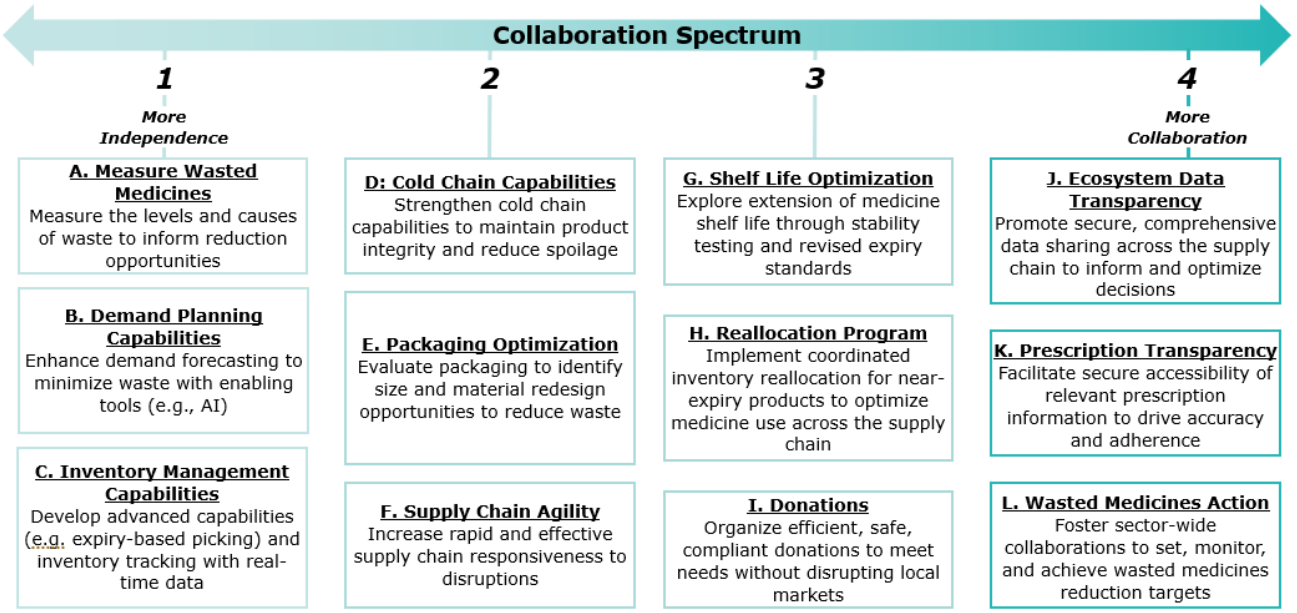
The Collaboration Spectrum

Consolidating these solutions into a single view helps to show the holistic approach needed to tackle the challenges and realize the opportunities presented by wasted medicines. Some solutions can be implemented rather independently, while others require coordinated action. A successful portfolio of solutions to reduce wasted medicines would include a mix of quick wins, which would generally be more under an organization's direct control and longer-term initiatives which generally require more collaboration. Figure 4 below depicts the 12 solutions explored in this section.

Figure 4



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Solution A: Measure Wasted Medicines

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	4

Description

The first step in reducing wasted medicines is for organizations to recognize waste is occurring and to commit to reduction efforts. As a starting point an organization should start to measure the extent of waste and to investigate where and how it happens. This critical step is possible for every organization and will lay the foundations for many of the other waste solutions.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Secondary Driving Stakeholders: Regulatory Agencies, Governments, Waste Disposal Organizations
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Waste tracking methodology:** Organizations need to establish an overview of current processes and determine a methodology for uncovering the root causes of waste.
- **Quantitative and qualitative analysis:** Taking action requires the continuous tracking of wasted medicines with quantifiable data and qualitative descriptions of reasons for increases and decreases of waste over time.
- **Impact on performance:** As organizations begin to track and measure wasted medicines, it will become important to understand how waste metrics correlate with operational and financial performance indicators. This insight will enable informed decisions on optimizing processes and reducing waste without compromising performance.

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Solution B: Demand Planning Capabilities

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	4

Description

Organizations can develop advanced demand planning capabilities by adopting best practices, investing in leading digital technologies and AI, and integrating new data sources. These improvements can reduce both overproduction, which contributes to wasted medicines, and underproduction, which can cause shortages and stockpiling. To strike the right balance between supply and demand and to also ensure medicines are not wasted, a feedback loop between upstream planning activities and downstream waste should be implemented.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Secondary Driving Stakeholders: N/A
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Current maturity:** Organizations with mature processes should continue to build on their capabilities, while those using manual methods should consider investing in technological and process upgrades to enhance forecasting accuracy.
- **Data sources and tools:** Examination of data sources and analytical tools being used will help an organization better understand and address gaps in forecasting capabilities and accuracy.
- **Organizational implications:** A lack of organizational alignment and data sharing can lead to poor forecasting; consider an Integrated Business Planning (IBP) process to support enterprise-wide planning optimization.

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Solution C: Inventory Management Capabilities

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	4

Description

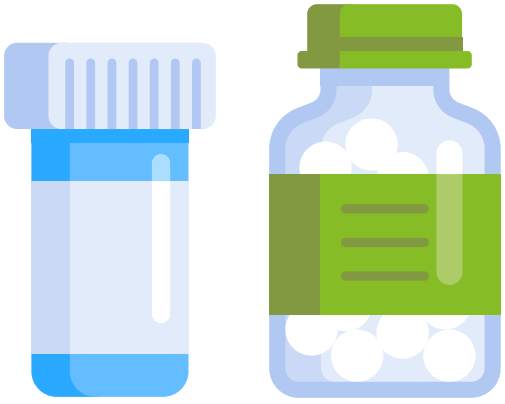
Advanced inventory capabilities, through strategies such as first expired, first out (FEFO) expiry-based picking, alongside leveraging real-time data and AI could greatly support reduction of wasted medicines. The healthcare sector has lagged other industries in this area, and there is considerable opportunity for improvement. The upside is that well-developed tools and capabilities are available and could be readily adopted, if prioritized.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Secondary Driving Stakeholders: N/A
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Investment in smart inventory management solutions:** Value stream mapping exercises are useful to understand, justify, and prioritize the investments in inventory management technologies that will reduce time (process efficiency), money (lower inventory levels), and waste (lower inventory waste).
- **Education on inventory management:** Harness external expertise to deepen organizational understanding of strategies (e.g. FEFO), tools and industry-leading business processes that optimize inventory management.
- **Organizational alignment:** Encourage organizational alignment and better data sharing to support forecasting and inventory planning.



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Solution D: Cold Chain Capabilities

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	**2**	3	4

Description

As the cold chain logistics market grows, with a projected 9% compound annual growth rate (CAGR) from 2021 to 2025 and an increase of over $9 billion[24], enhancing cold chain capabilities to minimize product spoilage has become increasingly important. Cold chain logistics are complex and expensive, but recent advances in materials and distribution service models – such as 'cold chain as a service', along with improved tracking and reverse logistics are leading to reduced waste and increased cost efficiency.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Cold Chain Packaging Suppliers
- Secondary Driving Stakeholders: Pharmacies, Providers
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Packaging / logistics material availability:** The expanded availability of advanced materials, such as vacuum-insulated panels and phase-change materials for reusable containers, provides organizations with more options, but also requires more considered selection processes.
- **Collaboration on reverse logistics:** Improved tracking and reverse logistics can reduce container loss, and thereby improve cost-efficiency.
- **Investment in smart technology:** Invest in and utilize integrated data monitoring and tracking technology to enable full supply chain visibility, supporting end-to-end product integrity and efficacy.

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Solution E: Packaging Optimization

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	**2**	3	4

Description

Optimize packaging size, quantity, and type to minimize waste by evaluating how medicines are dispensed to patients and considering variations across markets. Investigate which packaging choices contribute most to waste and adapt production strategies accordingly. Assess whether alternative packaging solutions could lead to more efficient medicine usage and less waste.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Packagers
- Secondary Driving Stakeholders: Pharmacies, Providers, Regulatory Agencies, Patients
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Dosage data transparency:** Analyze patient dosage requirements and wastage patterns to optimize pack size and configuration.
- **Supply chain handling:** Understand the handling process throughout the supply chain to tailor and optimize packaging for efficient medicine management.
- **Cost implications:** Assess potential cost impacts of packaging changes to inform, prioritize, and support decisions.
- **Environmental implications:** Consider environmental impacts of modifications to packaging size and materials to ensure changes to reduce waste align with organizational goals for environmentally responsible packaging solutions.

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Solution F: Supply Chain Agility

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	**2**	3	4

Description

Organizations develop supply chain agility capabilities through systematic and process improvements. This enhanced agility enables faster, data-informed, decisions in near-real time, helping to optimize business performance and minimize waste during supply chain disruptions. The use of emerging technologies, such as artificial intelligence, supported by a robust data and analytics foundation enables real-time scenario analysis and rapid adaptation to changing conditions.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Secondary Driving Stakeholders: N/A
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Data and analytics foundation:** Organizations should strengthen their underlying data and analytics foundation through improved system capabilities (e.g., data lakes, enterprise data fabric) and organizational capabilities (e.g., data science organization).
- **Technology investments:** Investments in emerging technologies (e.g., AI) can facilitate real-time, data-driven decision-making accelerating predictive capabilities, scenario planning, and responsiveness.
- **Leadership governance:** Agile response requires a nimble governance model enabling leadership to make quick decisions based on rapidly evolving information.

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Solution G: Shelf Life Optimization

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1 2 **3** 4

Description

Shelf life optimization involves a two-pronged approach to reduce wasted medicines through better alignment of expiry dates with actual product stability. The first strategy is to extend the shelf life of existing inventory through rigorous testing. The second is to advocate for new processes and standards to support longer shelf lives from the start. Thorough understanding of regulatory frameworks and detailed historical data on medicine storage are required.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Regulatory Agencies, Non-Government Organizations (NGOs)
- Secondary Driving Stakeholders: N/A
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Regulatory understanding:** Organizations should gain a comprehensive understanding of which products can have their expiry dates extended and what research and evidence will be needed to advocate. for regulatory processes that support longer, stability-based expiry dates.
- **Data and documentation:** Organizations will need the comprehensive, robust data and documentation to meet regulatory requirements to extend expiry dates.
- **Cost implications and funding:** The cost impacts of extension testing should be integrated into organizational decision-making processes. Substantial, programmatic, cross-sector funding will likely be needed to support development of new standards.
- **Public and industry engagement:** Education of public and healthcare stakeholders about the potential benefits of shelf life optimization—to reduce costs, shortages, waste, and environmental harms—will support advocacy, acceptance, and implementation.

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Solution H: Reallocation Program

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	**3**	4

Description

A reallocation program serves as a secondary marketplace for medicines that would otherwise be wasted, by dynamically connecting stakeholders with surplus stock (particularly of near-expired products) to those in urgent need of stock. Such marketplaces would potentially need monitoring by a third party or regulatory body to ensure market integrity and trust.

Stakeholder Impact

- Primary Driving Stakeholders: Distributors, Pharmacies, Providers
- Secondary Driving Stakeholders: Regulatory Agencies, Governments
- Other Impacted Stakeholders: Payors

Implementation Considerations

- **Inventory visibility:** Effective participation in a reallocation program requires stakeholders to maintain near real-time inventory visibility including expiry dates and locations.
- **Stakeholder connectivity:** Seamless connectivity between stakeholders to match supply and demand of excess and near-expired products is essential, ideally through automated web-based systems rather than manual processes.
- **Product integrity:** A reallocation program needs robust processes to maintain product integrity and to prevent counterfeit or improper medicines entering the supply chain.
- **Compensation mechanisms:** Establishing efficient compensation systems is essential for incentivizing participation and ensuring trust and fairness in the reallocation process.

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Solution I: Donations

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1 2 **3** 4

Description

Facilitate coordinated collaboration between marketplaces and demand sources so excess medicines can be donated to those in need, including under-insured patients, uninsured patients, or regions with unmet medicine needs.

Stakeholder Impact

- Primary Driving Stakeholders: Regulatory Agencies, Governments, Donation Marketplaces
- Secondary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Potential adverse effects:** Local markets can become overwhelmed by large volumes of donated medicines, causing disruptions in the local supply chains or expiration before use.
- **Regulatory frameworks:** Donations are subject to varying regulations, between, and even, within countries. As an example, different states in the US have their own Good Samaritan Laws for Drug Donation, which complicates the donation process. Standardization of regulations to facilitate, streamline, and simplify donations could have significant impact.
- **Matching donations with recipients:** Organizations need to identify and connect with appropriate markets and demand sources to ensure donated medicines reach the right patients.
- **Evaluation and monitoring:** Continuous monitoring of donation processes is crucial, to ensure effectiveness and to mitigate any unintended negative impacts on recipient markets.

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Solution J: Ecosystem Data Transparency

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	4

Description

Production and distribution decisions that fuel oversupply or undersupply of medicines are sometimes driven by a lack of visibility to downstream demand signals. If stakeholders could provide demand signals in a protected manner through a trusted third party or decentralized platform, manufacturers and distributors could make more informed production and distribution decisions, and downstream stakeholders could make more informed capacity management and medicine reallocation decisions. This transparency could mitigate the "bullwhip effect", reducing wasted medicines across the supply chain.

Stakeholder Impact

- Primary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers, Objective Third Party
- Secondary Driving Stakeholders: Regulatory Agencies /Governments
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Data management:** A trusted provider or secure platform should be the broker of information exchange across the ecosystem.
- **Privacy and competition guidelines:** To maintain privacy and market competitiveness, comprehensive data privacy and sharing guidelines should be established and aligned across the ecosystem.
- **Planning integration:** Organizations should leverage the shared data inputs to refine planning processes, particularly in relation to supply, demand, and capacity management.
- **Regulatory compliance:** Solutions must comply with regulatory and legal requirements to avoid real or perceived market collusion.

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Solution K: Prescription Transparency

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	4

Description

The clear and accessible provision of patient treatment information and medical histories enables prescribers and providers to ensure patients get the right medicines in the right quantities, at the right time. This solution not only reduces waste from incorrect or unnecessary prescriptions but can also reduce patient harms and foster better medication adherence.

Stakeholder Impact

- Primary Driving Stakeholders: Pharmacies, Providers, Regulatory Agencies, Governments
- Secondary Driving Stakeholders: Manufacturers, Patients
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Data management:** All stakeholders need to participate with comprehensive, consistent, and accurate logging of relevant patient and product information.
- **Privacy considerations:** Regulatory input and oversight on data sharing are essential to protect patient privacy.
- **Funding and support:** Establishing this system may require funding and governance from a central organization or a partnership of multiple stakeholders.
- **Stakeholder education:** Raising awareness about the benefits of a prescription transparency system, including the potential to reduce wasted medicines and patient harms, is crucial for securing buy-in and widespread adoption.

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Solution L: Wasted Medicines Action

Collaboration Scale *(1 = more independence, 4= more collaboration)*

1	2	3	**4**

Description

This solution encourages and progressively mandates organizations in the healthcare ecosystem to measure and report on wasted medicines and to set and achieve targets to reduce them. Regulatory and collaborative bodies (like the Sustainable Medicines Partnership) will likely play a crucial role, in designing and piloting solutions, standards, ecosystem behaviors and norms.

Stakeholder Impact

- Primary Driving Stakeholders: Regulatory Agencies, Governments, Stakeholder Associations, Collaborative Bodies
- Secondary Driving Stakeholders: Manufacturers, Distributors, Pharmacies, Providers
- Other Impacted Stakeholders: N/A

Implementation Considerations

- **Standardized measurements:** Consistent terms, methodologies, measurements, and frameworks are needed to enable internal and ecosystem progress tracking and benchmarking.
- **Leveraging tools and systems:** Organizations should first leverage existing tools and processes, supplemented by advanced technology and data analytics to monitor waste metrics, identify reduction opportunities, and design strategies to realize impact.
- **Integrated impact assessment:** Assess the financial, operational, and environmental impacts to inform and prioritize waste reduction actions that also improve performance and sustainability.
- **Goal setting and realization:** Establish clear ambitious (but achievable) goals for reducing wasted medicines, together with strategies for setting targets and tracking progress towards their realization.
- **Governance and accountability:** A governance and regulatory framework that encourages and incentivizes ecosystem-wide accountability should be established, to ensure organizations adhere to standards and regulations that will lead to substantial reductions in wasted medicines.

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Chapter 4: Where do we start?

Before deciding on specific solutions, organizations should solidify their understanding of foundational concepts and affirm their commitment to reducing wasted medicines. This chapter outlines a step-by-step approach to help guide organizations to evaluate their options, prioritize their actions, and maximize their impact on reducing wasted medicines.

Step 1: Acknowledge the Challenge

The first step to acting on wasted medicines is to acknowledge the problem and the organizational and ecosystem commitment it will take to drive change. Transparency about the complex, multifaceted drivers of wasted medicines will lay the foundations for effective solutions.

Step 2: Recognize the Opportunity

Understand that efficient management of medicines is not just about reducing waste but also about seizing opportunities for improvement. By addressing wasted medicines, your organization can uncover win-win scenarios that deliver cost savings, operational efficiencies, environmental sustainability improvements, and increased access to medicines. Finding these aligned benefits can transform challenges into valuable organizational and ecosystem improvements.

Step 3: Understand Your Role

Understand your organization's specific impact and responsibilities in the healthcare ecosystem and how they influence wasted medicines. Identify areas for improvement and integrate them with the organizational vision to demonstrate the relevance and urgency for your organization to reduce wasted medicines.

Step 4: Mobilize Support

Determine who within your organization should be aware of the need to reduce wasted medicines and who should be responsible for driving change. Initiatives may be led top-down by executives or can be driven by functional leaders from manufacturing, supply chain, procurement, logistics or warehousing. Sustainability teams could also play a significant role. Harness enthusiasm, ideas, and skills from across your organization to encourage a culture of innovation, collaboration, and action.

Step 5: Start Measuring

Begin with implementing Solution A: Measure Wasted Medicines. This is a solution that all organizations can start immediately. Measuring current levels of wasted medicines provides a baseline from which to investigate root causes, prioritize solutions, set targets, and monitor progress.

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Step 6: Determine Where to Act

Finally, identify the solutions that best align with your organization's capabilities and potential for reducing wasted medicines. This includes evaluating your role in driving solutions, the potential for success, cost and resource implications and ease of implementation. Use the "Where to Start" framework in Figure 5 to develop a strategic approach tailored to your status and future ambitions. This step ensures your actions translate into tangible reductions in wasted medicines and maximize co-benefits, contributing to more sustainable, efficient, and effective healthcare.

Figure 5:

CRITERIA	CONSIDERATIONS	HOW TO PRIORITIZE
Stakeholder Role	• Will your organization be driving the solution, collaborating on its implementation, or be impacted by the solution without an active role? • Is your organization able to be a first mover and mobilize the solution, or is collaboration required to build a coalition?	The more significant the role your organization plays in the solution, the more likely you are to be responsible for reducing wasted medicines and the more likely you are to bear the costs of organization and implementation. ***Recommendation:*** *Seek to strike a balance between solutions that your organization can play an active role in and those where you can contribute as a supporter, to manage resources efficiently.*
Potential to Reduce Wasted Medicines	• How broad is the scope of this solution? • How scalable is the solution? • Are there quick wins available to build momentum and support for scaling the solution? • Are there misaligned incentives that may hinder scaling the solution?	The broader the scope of the solution and the greater the ability to scale, the greater the potential impact, barring significant roadblocks from misaligned incentives in the ecosystem. ***Recommendation:*** *Prioritize solutions with the greatest potential to reduce wasted medicines, especially those with enabling quick wins to drive momentum.*
Cost and Resource Impact	• What resources (money, people) will it take to mobilize and scale the solution? • Is external funding possible to support this initiative (e.g., grants, governments, NGOs)?	The greater the cost of the solution, the more difficult it may be to secure the required resourcing, unless the benefits significantly outweigh the costs. ***Recommendation:*** *Assess and prioritize solutions based on required resources, cost-effectiveness, and potential return on investment.*
Ease of Implementation	• Are regulatory changes required? • How long will it take to deploy the solution? • What level of organizational change will be required to implement and sustain the solution? • How much collaboration is required for successful implementation?	The harder the implementation, the more challenging it will be to achieve success. ***Recommendation:*** *Evaluate the likelihood of success of each solution based on its implementation difficulty and then balance your portfolio of solutions between "easy wins" and "difficult triumphs".*

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Chapter 5: Conclusion

Reducing wasted medicines offers substantial opportunities to maximize medicine availability, improve cost and operational efficiencies, and reduce environmental harms; however, it also presents significant challenges, particularly with respect to ensuring patient supply, which will inevitably result in some medicines not being taken by patients. This report aims to help organizations navigate the complexities to design and implement a practical and balanced wasted medicines reduction strategy that will maximize the benefits and minimize avoidable waste.

This report describes the key drivers of wasted medicines and outlines multiple solutions, some of which can be started independently and immediately, and others that require multistakeholder coordination over several years. We also provide a 'Getting Started' guide to help organizations take action.

By taking actions to reduce wasted medicines, organizations can increase medicine availability, enhance patient care and well-being, strengthen the sustainability and resilience of the medicine supply chain, and make a positive impact on the environment.

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