SUSTAINABILITY IN HEALTH AND HEALTH CARE PROVISION

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ABSTRACT:

The concept of sustainability and its application to resource use and related issues has sparked a lengthy and dynamic discussion among scholars from various fields. However, there are still many sustainability challenges that have not been thoroughly explored. This chapter seeks to enhance our understanding of the system dynamics that contribute to the sustainability of complex service systems, like healthcare, with the help of digital enablers such as technology and platforms.This helps us understand the significance of technologies, especially digital platforms, in empowering individuals and encouraging them to interact and share their resources in innovative ways. This sets the stage for continuous value co-creation, which is crucial for the sustainability of healthcare systems.[4]

Keywords—sustainability; healthcare; health,provision,patient-centeredness; digital platforms; interaction type; care provision.

I. INTRODUCTION:

The Sustainable Healthcare System, as defined by the World Health Organization (WHO), operates in a manner that promotes, preserves, or rehabilitates health without causing harm to the environment and, wherever possible, seeks ways to enhance it. This approach yields benefits for the health and well-being of both present and future generations. It is well-documented that healthcare system activities exert a substantial impact on the environment and exert stress upon it. These activities involve the production of hazardous and non-hazardous waste, the generation of wastewater, and the release of greenhouse gas emissions. Moreover, there is a considerable consumption of vital resources, including water and energy. Estimates indicate that a significant portion, ranging from 75% to 90%, of waste generated within the healthcare sector has the potential to pose diverse environmental and health-related risks.

Fortunately, technological progress in the healthcare sector has showcased its capacity to deliver health benefits while also contributing to environmental well-being. Electronic e-health interventions have proven effective in improving health outcomes and expanding healthcare accessibility, simultaneously curbing pollution by reducing the necessity for travel and cutting costs associated with in-person care. Furthermore, diverse medical devices and technologies have played a role in conserving water resources and lowering wastewater production, thus mitigating the emission of greenhouse gases.

Healthcare systems came into existence post-1950, during Europe's post-World War II recovery. In response to public calls for healthcare services that were both affordable and within reach, governments, reflecting a shift towards left-leaning policies, initiated measures. Up until the 1970s, healthcare systems grappled with a shared dilemma: how to efficiently allocate an average of 7% of the national Gross Domestic Product (GDP), which was funded through tax revenues and labor contributions, to support healthcare services.[1]

Sustainability and sustainable development are intricate ideas that necessitate distinct approaches. Achieving a harmonious coexistence between socio-ecological and socio-technical systems, marked by their intricate interplay, is essential. Sustainability needs to grapple with the complications stemming from intricate and sometimes unequal human-based and social interactions, influencing decisions across social, economic, and environmental domains. To tackle these challenges effectively, a multidisciplinary approach is indispensable.

II. THEORETICAL BACKGROUND:

A Systemic Approach to Healthcare Sustainability:

In recent years, there has been increased focus in service research on sustainability, with different conceptualizations of this concept. Due to the fragmented nature of sustainability and its inherent complexity, scholars have called for additional approaches that can better understand the dynamic relationships involved. In this context, system thinking and the Viable System Model (VSA) developed by Stafford Beer are two appropriate approaches for enhancing the conventional definition of sustainability. These theoretical frameworks view sustainability as a comprehensive and interconnected system. They recognize it as a complex network of components, relationships, and dynamic interactions that occur over a specific timeframe. These interactions involve various stakeholders working together towards shared goals.

It is crucial to emphasize the intimate connection between relationships and interactions, as these concepts are intricately linked to a fundamental aspect of systems thinking known as the structure-system dichotomy. This dichotomy adopts a dual perspective that involves both static and dynamic observations of the existing reality. Golinelli and Gatti have defined the former as a logical or physical connection among the components of a structure, while they've characterized the latter as the activation of a structural relationship. This activation takes place when resources, data, or a combination of both are exchanged among different participants who are willing to share their knowledge to achieve a common objective. Consequently, interactions embody dynamic behaviours capable of transforming a structure into a system.

By directing our attention towards the Viable Systems Approach (VSA), we can enhance our comprehension of the pivotal role sustainability plays in ensuring the endurance of intricate service systems. Healthcare systems, in particular, are in harmony with the widely accepted characterization of service systems. These systems manifest as dynamic configurations of resources, encompassing individuals, technology, organizations, and shared information. Their purpose is to generate and provide value to both service providers and recipients through the delivery of services.

Moreover, healthcare can be perceived as a multifaceted and adaptable service system, entailing the cooperation of individuals, technology, as well as both internal and external service systems to generate value. This value materializes through the exchange of shared information, encompassing elements like language, regulations, and performance metrics. The intricacy of healthcare chiefly stems from the intricate interplay among diverse economic, functional, emotional, and ethical demands and expectations. Expanding upon the earlier discussion of healthcare's complexity, Saviano et al. underscored the significance of integrating and harmonizing the established objectives of efficiency and effectiveness with the concept of sustainability. Such integration is essential for enhancing the overall resilience of the healthcare system. Consequently, the conventional business principles that often prioritize immediate, short-term problem-solving without a strategic vision or a clearly defined direction need to be reconsidered.

Hence, there is a need for a fresh approach to address the diverse interests and objectives, as well as the complex and non-linear interactions among individuals, organizations, and institutions within the healthcare system. These interactions often lead to unforeseen outcomes. Currently, healthcare primarily emphasizes operational efficiency and strives to meet the expectations of political and institutional supra-systems. However, a new direction is emerging. This also aims to improve service effectiveness by changing the role of patients and combining resources in a more sustainable manner. This new approach requires a significant shift in the mindset of service providers. They should prioritize better patient satisfaction and transition from the traditional doctor-patient relationship to a provider-client relationship.

Two crucial concepts that lie at the heart of the relationship between health providers and clients, as well as the recent general healthcare reform, are patient empowerment and a patient-centered approach to care. These concepts are rooted in the belief that patients have the capacity to enhance their self-reliance and competence in managing their illnesses, enabling them to actively engage in the provision of healthcare services. This has resulted in a greater information imbalance that has long affected the relationship between physicians and patients. Specifically, the imbalance is primarily caused by patients relying on healthcare providers, which limits the shared and forward-looking utilization of resources necessary for sustainable healthcare development. This is a fundamental aspect of healthcare sustainability.

In reality, information asymmetry, which involves conflicting interpretations of schemes and categorical values, can hinder the creation of value for the entire healthcare service system. This is compounded by the reluctance or inability of patients and health professionals to share their personal resources, such as information. Consequently, the healthcare service system may be at risk of being destroyed. Therefore, the sustainability of healthcare service systems can be improved if the actors involved are willing to align their strategies and collaborate, in order to keep up with contextual changes, individuals need to constantly adjust and adapt their behavior. Recent advancements in ICTs and the increasing use of digital platforms have greatly empowered patients and helped to overcome information asymmetry. This has improved the interaction between health professionals, patients, and others. (e.g., families, peers, citizens, institutions, etc.).[2]

Why is Sustainable Healthcare important?

If we fail to transition to a sustainable healthcare model, the environmental impact of the healthcare sector will only worsen. Factors such as population growth, unhealthy lifestyles, rising chronic diseases, aging populations, and improved healthcare access are all expected to contribute to increased healthcare demands and resource consumption in the future.When we consider the expected healthcare consequences associated with climate change, the necessity for sustainable transformation becomes more evident and pressing. [2]

Four ways in which a Healthcare provider can turn more Sustainable:

A. **Chemical Safety Practice**

   Chemicals used in wheelchair cushions, fluorescent lights, CRT monitors, LCD screens, flame-retardant mattresses, and even baby bottles have the potential to be harmful. It is critical that hospitals recycle hazardous materials on a regular basis and make educated purchasing decisions.

B. **Follow Waste Disposal Protocols**

   The process of disinfecting medical waste can be energy-intensive and produce toxic gases. Healthcare providers want to think about implementing eco-friendly techniques for disposing of trash, like autoclaving, chemical treatment, and microwave ovens.

C. Save Energy

Although it may seem unachievable, hospitals may save energy and cut carbon emissions by improving their lighting systems, reprogramming their heating and cooling systems, and reengineering their air handling systems.

D. Preserve Water

By installing water-efficient toilets, faucets, and showers in restrooms, healthcare facilities can save millions of gallons of water annually. Furthermore, investing in dishwashers with high efficiency might help save water.

The active participation and collaboration of a dedicated workforce are essential for successfully enhancing environmental sustainability in healthcare systems. To achieve this, the system should involve healthcare workers in creating, implementing, and managing environmental sustainability measures. This involvement should also aim to instill a sense of ownership and responsibility among the workforce. Trivitron Healthcare is dedicated to a sustainable business model that provides value to millions of people worldwide. With over 1500 employees, 1200 channel partners, and nine world-class manufacturing units spread across the globe, we offer the best available health technology solutions.[3]

Advancement of Environmental Sustainability in Healthcare:

Pollution is a major contributor to illness and death, causing 9 million premature deaths in 2015, which accounts for 16% of all deaths worldwide (Landrigan et al., 2018). The majority of these deaths are attributed to air pollution, which is responsible for 1 in 8 deaths globally (Cohen et al., 2017).

By prioritizing sustainability in healthcare delivery, particularly in clinical care, we can effectively involve health professionals. Their leadership can then have a multiplying effect in engaging administrators, policy makers, and the patients they serve, in order to address pollution threats to global health and well-being with greater urgency.

III. APPROACH:

The objective of this narrative review was to delineate the scope of healthcare sustainability research, pinpoint research gaps, present a novel framework for research methodologies and tools, and establish research priorities aimed at augmenting the environmental sustainability of healthcare services. In this review, sustainability was defined in accordance with the principles set forth in "Our Common Future" (Brundtland, 1987) and the widely adopted Triple Bottom Line frameworks (Elkington, 1999).

HEALTHCARE EMISSIONS RESEARCH:

There has been a rise in global efforts to evaluate and decrease healthcare-related environmental emissions, specifically focusing on greenhouse gases (World Bank, 2017; World Health Organization, 2017; Watts et al., 2017). The United Kingdom's Sustainable Development Unit initially disclosed the greenhouse gas emissions of its National Health Service (NHS) England in 2009 and continues to provide regular updates every 2-3 years (Sustainable Development Unit, 2018). Following the implementation of a national benchmarking system, NHS CREATING AND INTEGRATING SUSTAINABILITY METRICS INTO EXISTING PERFORMANCE IMPROVEMENT REPORTING SYSTEMS:

Developing a robust and consistent set of measures that characterize environmental performance and track advancements is essential to optimizing performance. Standardizing and normalizing these data is necessary to allow for relevant comparisons. Multiple layers of this should be carried out, including provider groups, hospitals and health systems as a whole, clinical care pathways, particular goods, and national healthcare sectors (Mortimer, 2018a).

IV. EDUCATION:

- **Communicating Clinical Sustainability:**

Many health professionals face a major obstacle when it comes to practicing environmental stewardship in the workplace: a lack of knowledge and skills (Safety, 2016; Safety, 2014a, 2014b; Thiel, 2017). To address this issue, there is a growing demand for continuing education and quality improvement projects focused on clinical sustainability (Mortimer, 2018a, 2018b). As a result, professional societies are now offering specialty-specific post-graduate education opportunities.

- **Re-Thinking and Re-Design:**

At present, pollution from healthcare is indirectly harming public health and leading to a greater demand for healthcare services. To create a sustainable healthcare system and meet ambitious goals outlined by the Intergovernmental Panel on Climate Change (2018) and the UN SDGs (2020), a transformative vision is necessary. This vision must be implemented quickly due to the urgent need to address global environmental change.[3]

- **Health Care Financing and the Sustainability of Health Systems:**

The definition was expanded in 2007 to include the following: "A good health financing system ensures that sufficient funds are available for healthcare, allowing people to access necessary services without facing financial ruin or becoming impoverished. It also encourages healthcare providers and users to be efficient.".

V. THE DEBATE ON SUSTAINABILITY - NEW CHALLENGES IN THE 21ST CENTURY:

The evolution of health financing over the past 50 years has shown a significant change in key aspects. Prior to 1950, health systems were created for populations with an average life expectancy of 65-70 years. At that time, people retired around the ages of 60-65 and had high employment rates, allowing them to earn and save enough money to support a good healthcare system. As healthcare costs increased, everyone benefited from improved welfare.In the 21st century, the average life expectancy has surpassed 80 years, thanks to advancements in health science and technology. These improvements have enhanced the quality of life, even for individuals in their old age. However, it is important to acknowledge that extending life in good health comes with costs, which no democratic society can overlook indefinitely.

The fundamental political, economic, and ethical quandary centers around identifying the origin of essential funding. Even affluent nations can continue to depend largely on private health insurance, albeit raising substantial fairness issues. Conversely, the majority of developed and developing nations support their welfare systems, each with varying levels of development, through taxation and labor contributions. Globalization is giving rise to increased economic inequality and instability within these countries, igniting a substantial discourse regarding the sustainability of healthcare financing.

VI. GLOBALIZATION AND INCOME INEQUALITY:

Globalization has had a significant impact on income distribution, both within countries and among them. Thomas Piketty's influential work in 2014 demonstrated that globalization tends to benefit capital more than other sources of income, such as labor and rents. While increased capital mobility has helped lift many countries out of poverty, the advantages are primarily enjoyed by wealthy countries with substantial capital ownership. Additionally, globalization has led to increased income inequality within countries, with the highest income brackets claiming a larger portion of the national GDP. In addition to being a moral and political issue, growing inequality also has economic implications. Once it reaches a certain threshold, it can lead to various economic problems. For instance, the lack of income taxation diminishes the efficiency of welfare and safety nets, and weakens the competitiveness of the economy. This is especially crucial for developing countries that are currently establishing their healthcare systems.[4]

- **Recession and Economic Uncertainty:**

A notable feature distinguishing this century is the frequent recurrence of recessions resulting from income inequality, which in turn leads to reduced demand. Unemployment and economic challenges strain public finances, elevate the demand for public health services, and constrain access to private services. These profound pressures, exemplified after the 2008 economic crisis, have introduced the concept of financial sustainability into health policy deliberations. While the discourse continues to encompass funding and the value derived from investments, it now extends to a society's capacity to honor its implicit or explicit commitment to meeting healthcare demands based on necessity.

- **Financing Sustainable Health Care:**

While the debate continues to focus on funding and the value obtained from it, it now also takes into account a society's capacity to fulfill its implicit or explicit commitment to meet healthcare demands based on needs.This is likely why discussions on the sustainability of the health system persistently avoid addressing the issue of financing, possibly to evade two uncomfortable realities. First, relying on out-of-pocket expenses is unfair and does not provide adequate financial protection. Second, the rising cost of healthcare can only be covered through some form of income transfer, such as taxation.

The moral dimension of establishing "who bears the financial burden" and "how" is gaining greater significance, influenced by factors like aging populations, technological progress, globalization, and economic downturns. These elements are exerting stress on the sustainability of funding resources. Consequently, the focus of the question should expand, not only addressing whether the entire society will share the costs but also concentrating on the methods for securing and administering the required resources. Furthermore, it's essential to consider the efficiency and competitiveness of the economy, as it plays a role in generating these resources.

Many people attribute the rising cost of healthcare to demographic factors, but it is important to note that the majority of lifetime health expenses occur in the last two years of life. Over the past fifty years, life expectancy has significantly increased, leading to higher total lifetime healthcare costs. However, the average retirement age has remained relatively constant at around 65. This means that there are approximately twenty years during which individuals bear healthcare expenses without generating income as a form of "insurance". Today, individuals who are of working age are responsible for financing the healthcare expenses of their children, themselves, and particularly the 3rd and 4th generations. The labor contributions that were established thirty years ago are insufficient to cover the current medical costs. On the other hand, contributions that would be enough to cover future healthcare expenses would make labor excessively expensive. As a

result, the only viable solution seems to be implementing savings in the form of taxes on all income generated by society, including wealth and capital. This approach appears to be a sustainable source of funding of funding in the long-term.[4]

Furthermore, the frequency of cyclical fluctuations is increasing, moving away from their past status as rare occurrences. How health financing is managed plays a pivotal role in how health systems endure these pressures while maintaining equity, quality, and financial security. It has been noted that Social Health Insurance can have detrimental effects on the labor market, potentially impacting competitiveness by driving up labor costs. This issue is especially critical in monetary unions where the option of devaluation isn't available during economic crises. In such scenarios, the economy's recovery to pre-crisis levels primarily depends on improvements in competitiveness. Furthermore, escalating unemployment and decreasing incomes exert additional strain on healthcare budgets and public infrastructure. The available evidence suggests that healthcare systems funded through taxation are better equipped to respond to economic pressures and efficiently consolidate health expenditures. Although conclusive evidence may be lacking, the experiences of countries like Canada and Greece can offer some valuable insights.

Evidence from Canada, where healthcare is primarily funded through taxation, suggests that patient satisfaction, hospital performance, and health outcomes remained intact despite the financial burden. Concerns about increased private payments during economic downturns or corruption hindering tax collection can be dismissed, as individuals actually become more reliant on taxation during times of economic turmoil, price-sensitive and administrative capacity tends to improve.

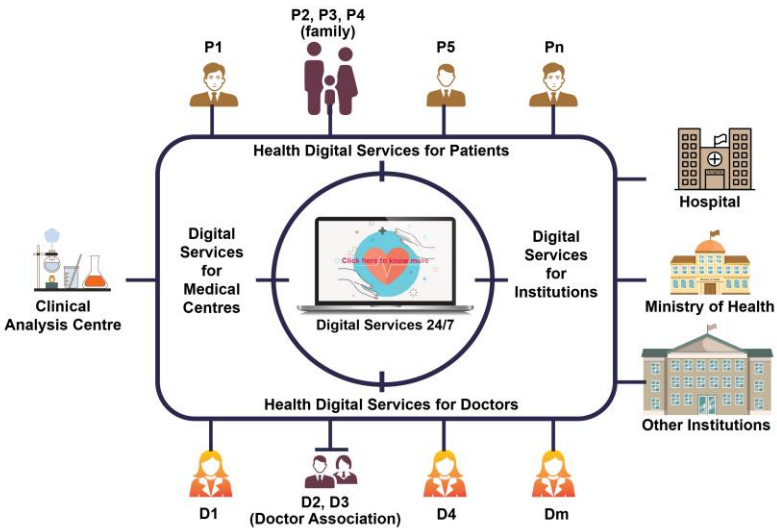
In Greece, historically, Social Insurance has covered around 40% of healthcare costs. However, due to a severe unemployment rate of 27% caused by a 25% contraction in GDP, relying on employer-employee contributions has proven to be an insufficient funding source for healthcare. From 2009 to 2012, Social Insurance spending decreased by 29.3%, resulting in a significant impact on the fairness of the system and the quality of care. Greece is now in a situation where there is an urgent need to reorient healthcare financing.

In conclusion, relying on employment contributions as the primary source of health financing is incongruent with the goals of achieving universal coverage, providing high-quality services, and extending life expectancy. Transitioning to a model of healthcare funding through general taxation has the potential to bolster economic growth, fostering competitiveness and addressing critical non-health objectives, including equity, financial security, quality, and responsiveness, even in the face of economic downturns. To ensure the sustainability of the healthcare system, it's imperative to prioritize it as a fundamental goal, moving toward financing through progressive taxation on all forms of income. While it might be uncomfortable to acknowledge, this reality should not be ignored. Considering political, economic, and ethical factors, it may be essential to rethink how healthcare services are financed in both developed and developing nations. The implementation of national health insurance funded via taxation could represent a viable avenue for creating more sustainable and responsive healthcare systems.

VII. PURSUING SUSTAINABILITY FOR HEALTHCARE THROUGH DIGITAL PLATFORMS:

Designing and Implementing a Digital Platform for Healthcare Services Sustainability:

Based on the interaction type meta-model, a prototype digital platform called Digital Services 24/7 has been created. This platform aims to enhance the interactions between doctors, patients, and other participants in healthcare systems. Its purpose is to gain a better understanding of how a digital application can improve these interactions. (e.g., hospitals, private clinics, clinical analysis centres, Ministry of Health, other health institutions, etc).



Digital Services 24/7 is a platform that has been developed based on the findings of a long-term research project. Its main functions include connecting freelance physicians with patients through a single application, providing a range of digital services such as booking appointments, accessing visit reports, and facilitating follow-ups. Additionally, it offers authorized access to health-related data for patients, physicians, public institutions, and private health organizations; The goal is to maintain a single database that can be utilized for predictive analysis using machine learning algorithms. This involves integrating both current and future digital devices, as well as

wearable devices, for data recording and analysis.

As mentioned earlier, Digital Services 24/7 is designed based on the logical foundations of the interaction-type meta-model described in the previous section. Its main goal is to facilitate interactions between actors and promote mutual information-sharing. This is crucial for providing updated and personalized health services and for continuously improving health-related processes. This diagram illustrates the high-level architecture of Digital Services 24/7. It aims to provide a clearer understanding of the potential interactions that the digital platform can facilitate among various actors or entities.

VIII. SUSTAINABILITY IN HEALTHCARE:

The Department of Health acknowledges the connection between the health and well-being of the people of Victoria and the health and well-being of the environment. We are dedicated to enhancing sustainability in the infrastructure and operations of the healthcare system. Our commitment to this cause is outlined in our Environmental Sustainability Strategy for the period of 2018-19 to 2022-23.

In order to support the implementation, we have published a strategic implementation plan, a 2021-22 action plan, a progress report, and a sustainability performance report that detail the steps we are taking to implement our agreed-upon actions. This section of the website is dedicated to enhancing the environmental performance of the health system.

Sustainable healthcare can be defined as a healthcare system that provides excellent care at an affordable cost, while also minimizing harm to the environment. It aims to meet the current health needs without jeopardizing the well-being of future generations.Sustainable healthcare involves recognizing the interconnectedness of our health and the environment, and taking actions that promote the well-being of both individuals and the planet.

In practice, sustainable healthcare is underpinned by three core principles:

1. Sustainable prevention

Promoting and maintaining people's well-being to the greatest extent possible diminishes the likelihood of illness or the necessity for medical intervention. It is equally vital to encourage individuals to play an active part in managing their health. This strategy aids in disease prevention and curtails the demand for healthcare resources. Emphasizing primary prevention (focused on health and lifestyle), secondary prevention (early disease identification via screening), and tertiary prevention (minimizing the consequences of established diseases) offers opportunities to realize sustainability advantages in the short and long term through reduced healthcare utilization.[5]

2. Sustainable pathways

Streamlining access to healthcare services and early disease detection frequently correlate with less resource-intensive treatments when healthcare is required. By guaranteeing that individuals access the right service at the right time and enhancing the efficiency and coordination of healthcare processes (such as the introduction of measures like digital triage and all-in-one diagnostic clinics), it is feasible to reduce the environmental footprint of healthcare by diminishing patient travel and eliminating superfluous or duplicated tests that are prevalent in fragmented healthcare systems.

3. Sustainable practice

Minimizing the carbon footprint and the broader environmental influence in patient care and treatment is of paramount importance. This objective can be achieved by curbing emissions and conserving resources while upholding superior health outcomes. A prime approach is the reduction of procedural waste, selecting eco-friendly products and materials, and reusing equipment when it aligns with clinical standards.

In parallel, organizations and healthcare practitioners must gather data that reflects the clinical efficiency and environmental consequences of their methods. This is significant because the endeavor to diminish the environmental impact of healthcare should not undermine the quality of care or healthcare outcomes.

IX. HEALTH CARE SUSTAINABILITY METRICS:

Building a Safer, Low-Carbon Health System:

As the awareness of the significant environmental impacts of the healthcare industry increases, there is also a growing interest in measuring and reporting sustainability as a part of healthcare system performance. This article explores valuable insights from the healthcare sector's extensive experience with performance and quality measurement and reporting, which can be utilized in developing sustainability metrics for healthcare.

While some major health systems, like Kaiser Permanente, have made significant investments in environmental stewardship, the measurement and reporting of healthcare sustainability in the US has primarily focused on corporate social responsibility and climate risk disclosure. Legacy infrastructure and complex supply chains can often limit the ability of healthcare organizations to gather data and manage their environmental impacts. However, similar to other areas of performance, measuring and reporting healthcare sustainability requires a well-defined conceptual framework and purpose. The measurement should align with strategic goals, rather than allowing goals to be determined solely by ease of measurement. Health system leaders should establish clear and compelling sustainability goals, invest in internationally comparable metrics to assess their progress, and integrate them into their core business.

- Quality of care
- Systems of care
- Global climate change
- Quality improvement
- Health services
- Health care providers
- Quality measurement
- Pharmaceuticals
- Public health

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Pollution from the healthcare industry has a direct negative impact on human health, and studies indicate that it contributes significantly to the overall burden of disease. At a national level, estimates suggest that the healthcare sector is responsible for approximately 7.9% to 9.8% of greenhouse gas emissions in the United States. As a result, some countries are taking steps to incorporate their healthcare systems into their strategies for meeting their obligations under the Paris Agreement, which aims to mitigate climate change. For example, the UK recently announced its commitment for the National Health Service (NHS) in England to become carbon “net zero” by 2040.

Increasing interest in how healthcare organizations and systems can improve their measurement and reporting of sustainability and environmental performance. The goal of healthcare sustainability reporting is to create a safe, low-carbon healthcare system using effective metrics. We recognize the need for improved reporting of the environmental impacts of healthcare, taking into account lessons learned from healthcare quality improvement and performance reporting.[5]

Health Care Performance and Quality Improvement Evolution and Approaches:

In the field of health care, the measurement and reporting of "performance" can encompass different aspects such as patient access, costs, efficiency, and more. However, in recent years, there has been a significant increase in the use and reporting of measures specifically related to clinical and service quality. Two main approaches have been identified for utilizing these performance and quality measures to enhance health care: In the field of health care, the measurement and reporting of "performance" can encompass different aspects such as patient access, costs, efficiency, and more. However, in recent years, there has been a significant increase in the use and reporting of measures specifically related to clinical and service quality. Two main approaches have been identified for utilizing these performance and quality measures to enhance health care.

The objectives of reporting on health care performance and quality include:

1. Accountability and transparency: This involves being accountable and transparent to the public, health care funders, and regulators.

2. Supporting improvement within organizations: Reporting helps organizations identify areas for improvement and supports their efforts to make necessary changes.

3. Aligning objectives of stakeholders: Reporting helps align the objectives of different stakeholders involved in health care, ensuring that everyone is working towards the same goals and priorities.

4. Providing comparative data: Reporting provides comparative or benchmarking data across organizations, allowing them to compare their performance with others and identify areas where they can improve.

5. Incentivizing improvement and value: Reporting can be used to link payment to performance, providing incentives for organizations to improve their quality of care and value for patients.

Reporting performance measures can lead to change and improvement through four pathways: change, where providers use the information to improve their own performance; selection, where users or purchasers switch providers based on the information; pay-for-performance, where providers receive financial rewards for superior measured performance; and reputational damage, or "naming and shaming" poor performers. It is important to note that measurement and reporting are two separate activities.

X. EXPERIENCE AND LESSONS:

While there is a significant amount of literature available on health care quality and performance measures, data sources, and statistical techniques, one of the most influential conceptual approaches to measurement is still AvedisDonabedian's typology. Donabedian's framework focuses on measuring the structure, process, and outcomes of care delivery, taking into account the physical, organizational, and institutional context.The process refers to the actions taken by all parties involved, while the outcomes refer to the ultimate effects on patients and populations. Through years

of experience, valuable lessons have been learned on how to effectively design and implement quality and performance measurement systems.

There is a conflict between using performance measures for external assessment and internal quality improvement, as well as between the approaches that are best suited for each of the four pathways of change. Performance and quality information is a valuable resource that cannot develop on its own without the active involvement and guidance of governments. It requires careful investment and attention. Measuring the performance of a health system at the system level requires a well-defined conceptual framework. This framework should not only encompass all important aspects of the health system but also be in line with its goals. It should integrate with the system's information technology systems and data collection infrastructure, and should be able to capture areas that are important but difficult to measure. Additionally, the framework should be designed in a way that allows for international comparisons.

XI. THE ENVIRONMENTAL SUSTAINABILITY OF HEALTH CARE:

A. Purpose, Context, and Governance:

Measuring the performance of a health system at the system level requires a well-defined conceptual framework. This framework should not only encompass all important aspects of the health system but also be in line with its goals. It should integrate with the system's information technology systems and data collection infrastructure, and should be able to capture areas that are important but difficult to measure. Additionally, the framework should be designed in a way that allows for international comparisons. However, the focus of this literature is mainly on greenhouse gas emissions. Other environmental issues, such as pollution caused by the release of pharmaceuticals into the environment, are also significant but have not been thoroughly analyzed. Additionally, it is important to note that just because technical measures are available (particularly those developed for research purposes), it does not mean they are suitable for use as performance reporting metrics. For a health care sustainability metric to be useful, it should serve similar functions as health care quality measures. Many technically precise measures may not be able to support these functions effectively.

There are various approaches to environmental reporting in health care globally, which reflect the differences between health systems and the intended purpose of environmental reporting(see online appendix table 1 for a summary).[6]

B. Climate Risk Disclosure:

In recent years, there has been a notable rise in the disclosure of climate-related risks by corporations. This increase is primarily driven by the demand from major investors who want more transparency regarding how susceptible companies are to different climate change risks. Numerous healthcare providers, insurers, pharmaceutical companies, medical device manufacturers, and supply firms have already participated in voluntary disclosure initiatives such as the Carbon Disclosure Project. The Bank for International Settlements' Financial Stability Board has established a Task Force on Climate-Related Financial Disclosures. This task force recommends that organizations across all sectors of the economy should willingly disclose their climate risk governance, strategy, risk management activities, as well as relevant metrics and targets. The International Monetary Fund has gone a step further by suggesting that mandatory global disclosures be put in place to address significant climate change risks. This approach aims to assist organizations in identifying their vulnerabilities to climate risk in a comprehensive manner, rather than solely reporting on carbon dioxide–equivalent (CO_2e) emissions.

C. Corporate Social Responsibility Reporting:

There appears to be a lack of reporting on sustainability in the US health care sector. Emily Senay and Philip Landrigan have conducted a study on how major US health care corporations report on sustainability, specifically through their corporate social responsibility reports or activities. Their findings reveal that the health care industry significantly trails behind other economic sectors in terms of the number of corporations, both for-profit and non-profit, that disclose sustainability data.This is important because, in the US healthcare setting, the main focus has been on large healthcare organizations including environmental impacts in their corporate social responsibility reporting and participating in sustainability initiatives such as the Healthier Hospitals Initiative.

There have been various organizational arguments put forward to explain this discovery. One argument is that healthcare organizations lack shareholder pressure. Another suggestion is the existence of a "moral offset," where the healing mission of healthcare organizations may reduce their sense of obligation to participate in corporate social responsibility or sustainability reporting. As of 2018, more than 1,200 hospitals in the US had joined the Healthier Hospitals Initiative. Jodi Sherman and Robert Lagasse suggest that the significant participation in benchmarking and sustainability improvement activities reflects a growing dedication among healthcare organizations.

D. Publicly Mandated Reporting:

The new Sustainable Health Dashboard by NHS England is widely regarded as one of the most comprehensive tools for reporting on environmental sustainability in healthcare globally. This dashboard provides performance data on a range of indicators, including governance, carbon emissions, resources, water and waste management, air pollution, plastics, and adaptation. It encompasses all NHS providers, clinical commissioning groups, and regions in England. The system

receives central investment and support for its establishment. In contrast, public health services in the Australian state of Victoria have less strict reporting requirements, which is more typical in international efforts. According to the state government funding policy, all public health services are required to report a standardized set of environmental impact measures. These measures can be included in their annual report or in a separate sustainability report. The measures to be considered include energy consumption, greenhouse gas emissions, water usage, and waste production. It is important to report both the total amounts and rates of these measures, such as per square meter of floor space or per patient separation or admission. The healthcare systems in the UK and Australia differ greatly from the US healthcare system. Nonetheless, their experiences are valuable, particularly in light of recent proposals to integrate sustainability metrics into Medicare's Quality Payment Program. This shift would transition health care sustainability from being solely a concern of private corporations to becoming a matter of public policy. One crucial lesson we can learn from the English and Victorian experience is that reporting on health care sustainability has improved over time. This improvement has been facilitated by a combination of legislation, strategy, and preparatory activities, all guided by a clear strategic purpose. It determines how the public health care reporting framework is derived from the state's Climate Change Act, which is driven by the international commitment of the Paris Agreement to achieve net zero emissions by 2050. [6]

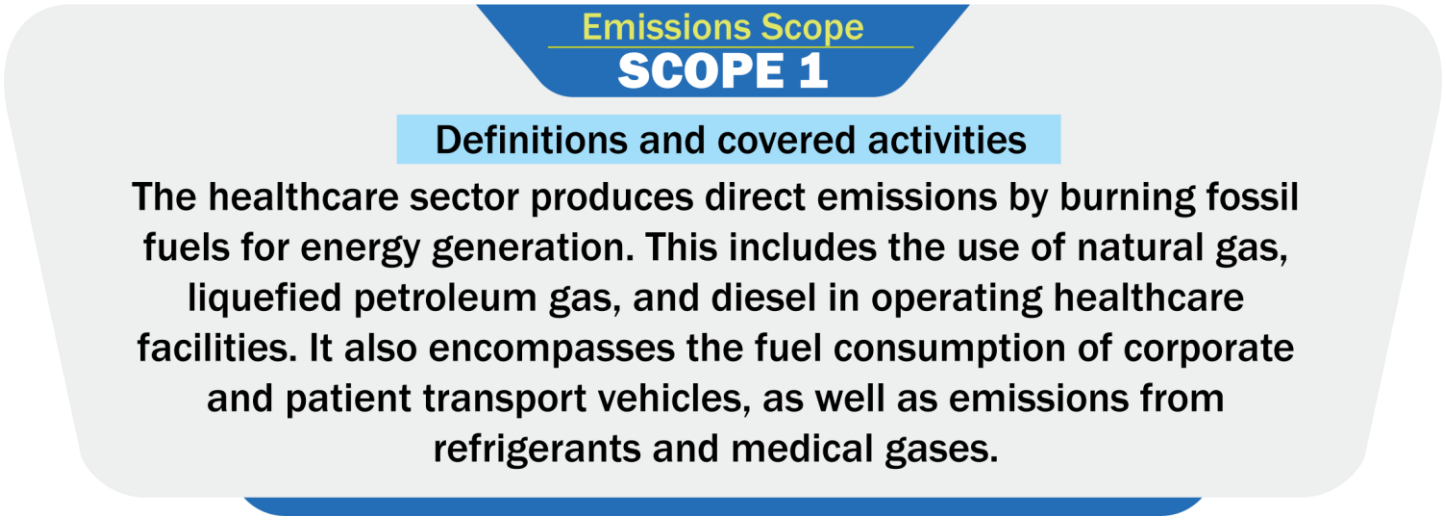
XII. ORGANIZATIONAL LEVEL AND UNITS OF REPORTING:

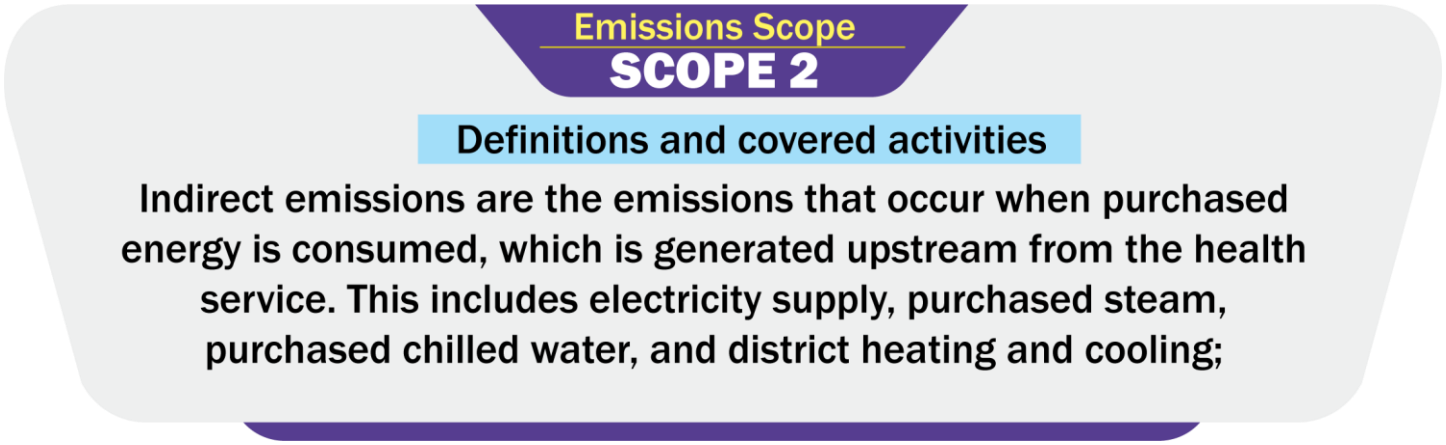
The specific objectives of performance reporting have important implications for selecting measurement and reporting methods. When it comes to reporting on healthcare quality, different approaches are required at different levels, such as health systems, individual services, wards, or clinicians. A healthcare service as a whole may generate internal benchmarking reports or performance league tables for multiple units or services.However, public accountability necessitates a distinct strategy. Pay-for-performance and corporate social responsibility reporting are typically carried out at the organizational level. In the case of healthcare environmental reporting, it is crucial to determine the appropriate scope and level of reporting. This decision should be guided by a well-defined strategy and implemented in a systematic and logical manner.

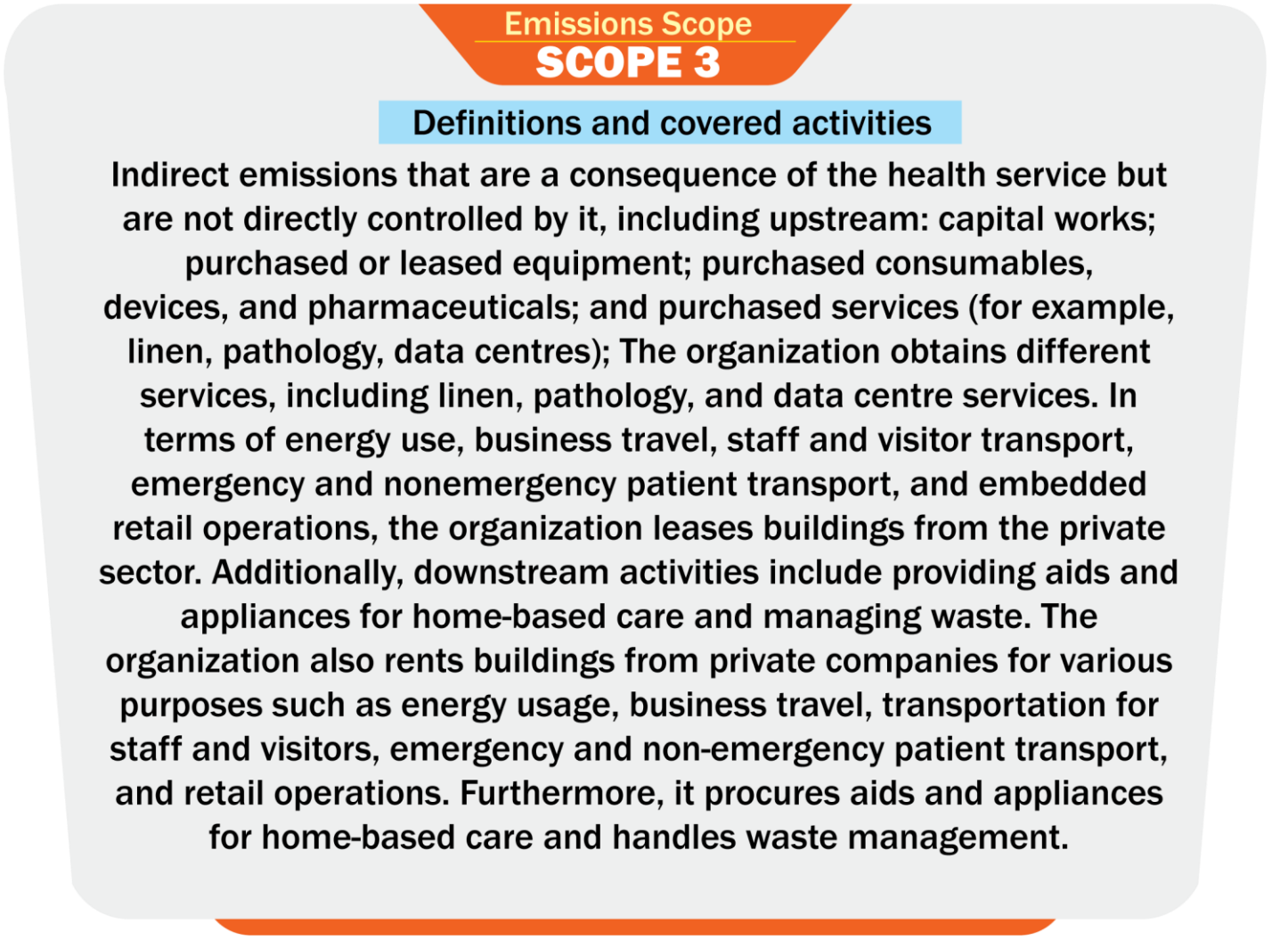
XIII. SCOPE OF MEASUREMENT AND CONTROL:

Measuring greenhouse gas emissions for performance purposes is a complex task because the impact of individual healthcare providers or teams on emissions can vary throughout the entire healthcare product value chain. The Greenhouse Gas Protocol categorizes greenhouse gas emissions into three groups: Scope 1, Scope 2, and Scope 3. These three types of CO_2e emissions represent different categories of emissions. Scope 1 refers to emissions that are directly emitted by the health service. Scope 2 refers to emissions that are indirectly emitted from purchased energy. Scope 3 refers to emissions that are indirectly emitted from other points in the supply chain.

EXHIBIT: 1 - DESCRIBES THE ALLOCATION OF EMISSIONS ACROSS THESE SCOPES.







Note: Gas emissions in Scope include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride**.**

The ability to influence CO_2e emissions Scopes varies greatly among and within healthcare organizations. For example, certain clinical services, like cardiology, may have limited direct control over Scope 1 or 2 emissions. However, they may have a significant opportunity to influence decision-making regarding the procurement of clinical equipment and drugs, which contribute to Scope 3 emissions.The importance of Scope 3 emissions in procurement, particularly in the pharmaceutical industry, has been emphasized multiple times. Clinical services, and even individual clinicians, can have significant influence over procurement choices for specific clinical supplies. When there is a reasonable level of control, Scope 3 emissions from procurement can be quantified and reported at the service level, rather than solely at the institutional level. However, measuring Scope 3 emissions requires aggregating data from various products and services throughout the entire supply chain, which assumes the availability of relevant supplier data.

Electricity is typically the main contributor to Scope 2 emissions, and many healthcare facilities rely on local utility grids for their electricity supply. These facilities can choose to either install their own renewable energy sources or purchase electricity generated from renewable sources from alternative suppliers. Considering the significant size of the healthcare sector (which accounts for 17 percent of the US gross domestic product), it has the ability to exert substantial influence on energy providers if health systems collaborate. However, individual hospitals typically lack direct control

over the source of electricity in their local grid. In 2019, Queensland, Australia generated only 14 percent of its electricity from renewable sources, while Victoria generated 23.9 percent from renewables. In contrast, Tasmania had a significantly higher percentage of renewable sources, with 95.6 percent of its electricity generation coming from hydro power. Hence, a hospital in Tasmania, which is identical to a hospital in Queensland in all other aspects, would have Scope 2 emissions that are six times lower because of its favorable location.

Having a clear understanding of the goals of health care sustainability reporting is crucial. It is also important to establish a clear purpose regarding the priority given to improvement or accountability objectives. If the purpose of reporting on gas emissions performance is to make a fair comparison of factors that the health service can control, it would be appropriate to statistically adjust for the renewable energy content of the local electricity supply. Applying risk or case-mix adjustments in clinical measures helps account for variations in risk among different populations. This is similar to how adjustments are made to account for differences in energy supply when reporting for improvement purposes. However, it is not suitable to use statistical adjustments to encourage health services to transition to low-carbon energy sources.

XIV. PRIORITIES FOR DEVELOPING HEALTH CARE SUSTAINABILITY REPORTING:

The most important lesson from the history of health care quality reporting is not technical but concerns the essential need for reporting to align with and support the strategic goals of the health system.Perhaps the best example of strategically aligned environmental reporting to date lies in the explicit nesting of sustainability goals and reporting within the 2019 NHS Long-Term Plan. This approach builds on a track record of systematic gains, with the English NHS having reduced carbon emissions by 18.5 percent between 2007 and 2017 and water use by 21 percent between 2010 and 2017. These reductions were achieved in no small measure through ongoing central support over a decade for national policy design, local implementation, and consistent measurement practices, driven by the national NHS Sustainable Development Unit.

Similarly, Kaiser Permanente has achieved significant success over a long period (including a 29 percent reduction in gas emissions between 2008 and 2018) and has built on past momentum by establishing explicit strategic goals supported by performance measurement. Tonya Booneprovides an extremely useful set of case studies on how individual US health care organizations have used local performance measurement to support their sustainability efforts. [7]

More broadly, Exhibit - 2 explores some potentially important areas for the future development of health care sustainability metrics. The exhibit suggests a number of areas that should be high on the agenda of those considering how better to develop systemwide sustainability reporting to support both accountability and improvement.

EXHIBIT: 2 - FUTURE DIRECTIONS AND PRIORITIES FOR DEVELOPING HEALTH CARE SUSTAINABILITY METRICS

Target Areas	Areas to prioritize
Gas emissions	Clearer framing of strategic purpose and goals for reporting at national, state, health system, and organizational levels and of health care system contributions to overall emissions reduction targets; assessment of highest-priority areas for advancing Scope 3 emissions measurement for both reporting and improvement purposes.
Health-damaging pollutants	Identification and quantification of those health care environmental impacts that have the most severe impacts on human health to guide prioritized development of measures of harm reduction.
Reducing overuse	"Double duty" measures that capture the improvements to patient outcomes and environmental impacts from reducing health care overuse.
Simplified Life Cycle Assessment methods	Invest in the development of simplified, low-cost Life Cycle Assessment methods and capabilities, allowing rapid and economical expansion of Life Cycle Assessment to support health care environmental impact measurement at all levels.
Pharmaceutical pollution and waste	Development of system- and local-level measurement techniques to capture the scale and impacts of pharmaceutical pollution, including manufacturing, distribution, use and wastage.
Composite measures	Investigate the feasibility and design of composite measures or indices to capture multiple dimensions of health care environmental impact (for example, greenhouse gases, air pollution, chemical pollution, resource depletion).
Absolute versus relative measures	Balanced metric sets that support improved efficiency (relative measures) while also reducing overall environmental impacts (absolute measures) to support "absolute decoupling" of health care from environmental degradation.
Single-use versus reusable consumables	Rigorous and comprehensive measures of environmental impacts of single-use versus reusable consumables, drawing on experiences from COVID-19.

Exhibit - 2, emphasizes the importance of achieving better integration of health care environmental sustainability reporting with reporting on quality and performance. The intimate relationship between poor-quality care, waste, overuse, and poor environmental outcomes is becoming increasingly clear. Meanwhile, the moral and public health imperatives for the health care system to minimize the harm to human health it causes through pollution are unambiguous. The idea that environmental sustainability should be incorporated as an explicit aspect of quality is not new.

The Royal College of Physicians argued that sustainability should be included as a domain of quality in 2011, others have suggested that sustainability is a key dimension of the population health component of the "Triple Aim" or even that it should be incorporated as a "Quadruple Aim." The recent Sustainability in Quality Improvement framework develops the integration of environmental sustainability as a core element of quality and value in health care.Yet these approaches appear to have gained traction primarily in the UK, and the link to sustainability seems not yet to have been accepted as "core business" by the health care quality improvement community elsewhere.

XV. EMERGING LESSONS FOR HEALTH CARE SUSTAINABILITY REPORTING:

a. Consistency and Comparability:

The development and adoption of measures of health care quality has evolved in a diverse and disparate landscape over the course of several decades. The mandatory reporting approaches emerging in the UK and other jurisdictions with largely public health care systems show great promise, not least because common and consistent standards for data and reporting can be enforced centrally. Yet nonmandatory approaches (such as corporate social responsibility reporting or Healthier Hospitals) can also deliver substantial benefits, especially if stakeholders come together to work toward using consistent and comparable standards and measures. At the same time, national and international comparability is important.

The World Health Organization has played an important role in harmonizing data standards and classifications in key measurement infrastructure, most notably the International Classification of Diseases and the system of national health accounts. Internationally comparable, validated, and standardized sustainability indicators need to be agreed to and implemented by all nations.Whether or not the US remains a member, the World Health Organization is best placed to lead this work.

b. Measurement Challenges:

An important technical challenge for sustainability and measurement involves measurement techniques, and especially the extent to which it is possible to directly measure key environmental impacts or whether estimation techniques must be used. The rapid growth in health care quality and performance measurement has been possible because of burgeoning digital health care data. Vast quantities of data from health care records, patient administration systems, and clinical data registries are now available.

Life Cycle Assessment techniques (the mainstay for undertaking detailed assessment of environmental impacts at the service or product level) are demanding in terms of expertise and are relatively expensive; environmental impact data across the health care value chain cannot yet be generated organically. Building management systems, procurement and inventory management systems, fleet management systems, and pharmacy systems all represent sources for automated environmental reporting data, but their full use will require careful, systematic investment in design, standardization, and verification. System leaders and policy makers need to work together to achieve and invest in this standardization.[8]

c. Avoiding Perverse Outcomes:

Measurement and reporting have been essential components of management and public policy since the nineteenth century. Much accumulated experience exists regarding what can go wrong in efforts to measure performance in many sectors. Most important, truisms along the lines of “you can’t manage what you can’t measure” form only part of the story. Equally true is the aphorism attributed to Gen. James Willbanks (referring to the Vietnam War): “If you can’t count what is important, you make what you can count important.” There is no intrinsic reason why sustainability metrics will not run the same risk; health care systems have proved themselves more than capable of “hitting the target but missing the point.”

The potential for unintended consequences exists in all aspects of health care improvement. It is important to include hard-to-measure health care priority areas,ensuring that measurement focuses on greenhouse gas emissions and on other environmental impacts, such as pharmaceutical pollutants.

d. Political Context:

Although this article has highlighted successful examples of sustainability reporting in public health care systems, constraints of ideology, climate denialism, and obfuscation affect many nations’ public policies. Despite significant achievements by several Australian states and territories, the authors encountered unwillingness at the federal level to incorporate sustainability during the design and negotiation of the current Australian Health Performance Framework.The feasibility of incorporating environmental reporting into US federal health care programs and mandates also may remain highly politically dependent.

XVI. HEALTH-CARE QUALITY IMPROVEMENT AND SUSTAINABILITY:

A simple way to put knowledge and skills into practice and make the shift to a sustainable health system is to use quality improvement tools. Enhancing patient outcomes and system performance in a consistent and methodical manner is possible through quality improvement. It has evolved over the last ten years into a crucial component of health professions education, appearing in both core curricula and professional standards for practice across a range of academic programs, from undergraduate degrees to postgraduate training.

A methodical approach is needed to improve the quality of the healthcare system, one that includes developing, testing, and putting changes into practice while continuously assessing their effects. The application of quality improvement methods can help achieve this. Healthcare practitioners can effectively tackle environmental issues and incorporate sustainability into their professional practice by incorporating it into quality improvement initiatives.

Furthermore, combining sustainability with an established approach to change can aid in the methodical upskilling of the healthcare sector.

Aspects of quality such as patient experience, safety, efficacy, efficiency, equity, and timeliness serve as a roadmap for improvements in healthcare. One crucial component of quality that ought to penetrate and govern the other domains is sustainability. In addition to current patients, the general public and future generations should also be considered when providing healthcare.

Sustainability in quality improvement (Sus QI) is a cutting-edge paradigm that incorporates economic, social, and environmental sustainability into the practices of quality improvement already in use. It is a comprehensive strategy for improving healthcare that assesses value and quality from the standpoint of the "triple bottom line" (an equation borrowed from Mortimer et al., which reads, "SUSTAINABLE VALUE = Outcomes for Patients and Populations Environmental + Social + Financial Impacts").

In other words, the overall sustainable value of a system, service, or process in healthcare is determined by weighing its effects on the environment, society, and economy against the health outcomes for patients and communities. A unified conceptual framework for broadening the area of healthcare quality improvement is provided by using the triple bottom line in the design and assessment of health outcomes.

In three important aspects, this approach helps the transition to sustainable healthcare. First of all, it broadens the definition of cost to encompass not just monetary factors but also social and environmental resources, which are integral parts of the system. Second, it emphasizes that overuse of financial, social, and environmental resources makes it impossible to maintain even highly valued results. Finally, it recommends that in order to reach decarbonization targets, new talents in carbon foot printing are needed. Environmental implications are suggested as a measure of value.

The Sus QI framework consists of four steps that incorporate social and environmental sustainability into existing quality improvement methods. This framework aims to guide change towards the most valuable improvements. By focusing on reducing healthcare activity and the carbon intensity associated with it, the Sus QI approach facilitates the transition to sustainable healthcare. The framework generates ideas for change by aligning them with certain principles of sustainable clinical practice of prevention, patient empowerment and self-care, lean pathways, and low-carbon alternatives. [9]

The UK's healthcare workforce has executed multiple quality improvement (QI) initiatives with success. Through the reduction of nitrous oxide use in operating rooms, the elimination of duplicate medication orders, the improvement of inhaler disposal procedures, the reduction of needless cannula use in emergency rooms, and the implementation of nature-based interventions like green walking in inpatient psychiatric units, these projects have produced triple-bottom-line improvements.

Significant cost savings and reductions in carbon emissions have been realized by several of these initiatives. A team calculated that they would save more than £78,000 and cut 107 tonnes of CO2 emissions annually. This is the same as nearly 308,000 miles driven in a car. They accomplished this by performing appendix ectomy surgery utilizing cutting-edge gasless technology. An other group initiated the early mobilization of patients in a cardiac intensive care unit, leading to an approximate reduction of 50 tonnes of CO2 emissions and a financial gain of more than £1•2 million over a two-year period due to shorter hospital stays.

XVII. SUSTAINABLE QUALITY IMPROVEMENT IN EDUCATION:

With the increasing popularity of quality improvement in health professions education, there is a wonderful chance to meaningfully and practically integrate sustainability into the curriculum. Throughout the UK, a number of healthcare education and training programs have used the Sus QI framework. As part of an effort to improve generalist abilities for the workplace in an increasingly complicated environment, it has been added to the postgraduate training curriculum for doctors in England.

Education on Sustainable Quality Improvement (Sus QI) can be carried out via online self-study, interactive workshops, or the use of instructional resources. With the use of these tools, students will be introduced to the idea, methodology, and technical know-how needed to carry out Sus QI tasks, including carbon computation. Students often have to create project proposals or work on long-term quality improvement initiatives in their clinical settings when they are in academic settings.

Sus QI is mostly taught by demonstrating how adding sustainability improves the current process of quality improvement. A Sus QI workshop aims to teach students how to incorporate sustainability concepts into each phase of their job or project related to quality improvement. This method guarantees that students pick up and put to use the fundamental knowledge and abilities needed for sustainable healthcare.

Examples of how each stage of the Sus QI framework can help learners acquire fundamental knowledge and abilities in sustainable health care are shown in the table.

Table:The core knowledge and skills in sustainable healthcare that I have acquired through Sus QI education.

	The core knowledge and skills acquired in sustainable healthcare	Example educational activity
Step one (1): Setting goals	It is crucial to use the triple bottom line to determine the main goal of a quality improvement approach in order to understand the elements of the triple bottom line and its connection to healthcare quality.	Explain how each component of the triple bottom line will be integrated into each phase of your project, which is designed to lower hospital admissions for a certain patient population.
Step two (2): Study the system	The purpose of this analysis is to identify the social, economic, and environmental resources used in healthcare. In addition, it looks for places with high carbon emissions, places where resources can be cut or removed, and the social effects of healthcare on disadvantaged populations, employees, patients, and families.	A process map can be used to pinpoint places where excessive use of social, economic, and environmental resources occurs when a patient is brought to your department.
Step three (3): Design the improvement	Understanding the tenets of sustainable clinical practice—prevention, patient empowerment and self-care, lean routes, and low-carbon substitutes—is crucial. These guidelines are essential for directing improvement initiatives toward the most beneficial interventions.	Using a driver diagram, you can come up with change suggestions based on sustainable clinical practice to address the problem of delayed discharges in your department. This will successfully help to improve the issue.
Step four (4): measure the impact	Learn how to recognize and quantify environmental, economic, and social resources. Gain knowledge in carbon footprint assessment and acquire the skills to conduct basic carbon calculations.	To determine the carbon emissions reduction resulting from the implementation of an online consultation service, as well as to assess the social impact on patients, staff, and the broader community.

Sus QI=sustainability in quality improvement.

It has been demonstrated that incorporating Sustainable Quality Improvement (Sus QI) into health professions education at the undergraduate and graduate levels increases students' motivation and engagement with quality improvement and sustainable healthcare. In a research project, Clery et al. instructed undergraduate medical students in Sus QI at the University of Bristol in the United Kingdom. The findings revealed that 94.2% of students who responded to post-teaching session questionnaires (n=121) said they were likely to take action to lessen the environmental impact and carbon emissions of their future clinical work, and 95.0% of students agreed that quality improvement projects were beneficial with a sustainability focus are important for health care.

In a study conducted by Spooner and colleagues, they examined the impact of Sus QI teaching on learners from multiple centers and disciplines. The results revealed that learners experienced a significant change in their perspective regarding the significance of quality improvement and sustainability. They were also able to view themselves as catalysts for bringing about positive changes in the healthcare system.

This study also supported earlier research showing that students and healthcare professionals are motivated to address climate change. It was discovered that those with the strongest environmental motivations also intended to incorporate Sustainable Quality Improvement (Sus QI) principles into their clinical practices at the highest rates.

In conclusion, there is mounting proof that the Sus QI framework enables medical professionals and students to incorporate planetary health principles into their clinical work. Healthcare organizations and educators can support the shift to ecologically sustainable healthcare systems and close the skills gap in healthcare education by implementing Sus QI into their curricula. By doing this, they will be able to address the educational requirements of a workforce that is becoming more conscious of the effects of climate change on health and is driven to alter clinical practices in order to lessen the adverse effects on the environment. 10]

CONCLUSION:

We have discussed how sustainability reporting builds on successes and experience in health care performance and quality measurement. There are always two possible aims for reporting in health care systems—accountability and improvement—but different measures and approaches may achieve one of these aims better than the other. In order for a performance measurement reporting system to be meaningful and effective, it is important to have a clear conceptual framework and purpose. The selection of appropriate technical measurement approaches should be based on this purpose, rather than being driven by the availability of measurements, which can lead to distorted goals. It is important to avoid placing too much emphasis on greenhouse gas emissions, which are easier to measure, while neglecting other

environmental impacts. The best results will be achieved by clearly showing how factors such as population health, clinical quality, and environmental sustainability work together and support each other.

The measurement and reporting of health care sustainability are lagging behind the efforts to improve health care quality through measurement by about two decades. It is crucial to address this issue urgently in order to make significant improvements in sustainability. Health systems need to quickly learn from the wealth of evidence gathered over the past few decades on quality measurement and reporting. We must strive for large-scale change in a much shorter time frame than the one it took for Donabedian to study quality improvement. To address this deficit effectively, health system leaders must prioritize the following actions urgently:

1. Establishing clear and compelling strategic goals for the sustainability of healthcare, possibly guided by the NHS Net Zero approach.
2. Developing, adopting, and implementing internationally comparable and standardized metrics in collaboration with other nations and health systems. These metrics should be aligned with the established goals.
3. Ensuring that these goals and metrics are firmly integrated into the mainstream infrastructure of quality improvement. performance, and accountability. [10]

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