SUSTAINABILITY IN HEALTH AND HEALTH CARE PROVISION

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**ABSTRACT:**

Sustainability, as well as the sustainable use of resources and related issues, has inspired a long-lasting and lively debate among scholars of different disciplines. Due to under-investigation of several of the sustainability related challenges, this chapter aims to better understand the system dynamics that, supported by some digital enablers (e.g., digital technologies and platforms), boost the sustainability of complex service systems such as healthcare. This allows understanding of how important the role of technologies and, in particular, digital platforms, are in empowering actors and in making them willing to interact, and share their own resources in continually new ways. This paves the way for ongoing value co-creation, which is essential for healthcare system sustainability.[1]

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

**I. INTRODUCTION:**

The World Health Organization (WHO) defines a Sustainable Healthcare System as a system that improves, maintains or restores health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations. There is clear evidence suggesting that activities of a healthcare system significantly impact and pressurize the environment. These include generation of hazardous and conventional waste, waste water and greenhouse gas emissions, and the high consumption of resources such as water and energy. In fact, between 75% and 90% of waste produced in health care may pose a wide range of environmental and health risks.

Fortunately, technological advancements in the healthcare sector have shown the potential to provide health and environmental benefits. Electronic e-heath interventions have improved health outcomes and access to care, reduced pollution through reduced need for travel and saved costs through reduced need for care. Various medical devices and technologies have also contributed to reduction in water usage and production of wastewater, thereby negating greenhouse gas emissions.

Health systems appeared after 1950, as Europe was healing from the 2nd World War. With a political shift to the left, governments responded to public demands for affordable health services accessible to all. Until the 1970’s, health systems shared one concern: how to funnel an average 7 % of national Gross Domestic Product (GDP) collected through taxes and labour contributions into health care services.[1]

Moving on from the seminal assumptions of the Brundtland report, sustainability has gained momentum over the years, attracting the attention of scholars belonging to different disciplines. This has also led sustainability research to go beyond the initial mere environmental perspective to also approach the social and economic domains. Even though the notion of sustainability is broadly whispered and accepted, the ways it has been explored and conceptualized remains vague and somewhat blurred. Thus, being multifaceted concepts, sustainability and sustainable development cannot be approached in a similar and integrated way. Therefore, they call for balancing socio-ecological and socio-technical systems, which their several inner interactions make inherently complex. Thus, sustainability has to face complex issues arising from the intricate and often unbalanced human-based and social interactions that affect decision-making at social, economic and environmental levels. To challenge these issues, a multi-disciplinary approach is required.

**II. THEORETICAL BACKGROUND:**

**A Systemic Approach to Healthcare Sustainability:**

In recent years, service research devoted greater attention to sustainability, conceptualizing it in several and, sometimes, different ways. Dealing with this fragmentation and recognizing the inner complexity of sustainability, scholars called for further approaches that are able to grasp the dynamic relationships that inherently characterize it. In this direction, system thinking and the VSA built upon the Viable System Model of Stafford Beer, represent two suitable approaches for advancing the traditional definition of sustainability, moving it towards an integrated and system approach. These theoretical frameworks consider it as a complex network of components, relationships and active interactions, occurring over a specific period of time, between different actors, aimed at reaching shared goals.

Focusing on relations and interactions, it is worth noting that these concepts are closely linked to one of the essential elements of system thinking, the structure–system dichotomy, built upon a dual approach (static and dynamic) to the observation of the extant reality. Drawing on these two concepts, *Golinelli* and *Gatti* defined the former as a logical or physical connection between the components of a structure and the latter as the activation of a structural relation, which occurs when resources, data, or both, are exchanged between different actors, willing to share their knowledge in order to achieve a common goal. It follows that interactions reflect those dynamic behaviours that can change a structure into a system.

Shifting the focus to the VSA, it represents a suitable interpretative lens for better understanding the importance of sustainability for the viability of complex service systems. Thus, healthcare systems are well suited to the mainstream definition of service systems, according to which they are dynamic configurations of resources (people, technology, organizations and shared information), which create and deliver, through service, value for both providers and customers.

Moreover, healthcare can be further considered to be a complex and adaptive service system, being a value co-creation configuration of people, technology, internal and external service systems connected by value propositions and shared information, for example language, laws, measures and thus, healthcare complexity mainly lies upon the interrelations of several different and sometimes opposite economic, functional, emotional and ethical needs and expectations. Drawing on the aforementioned healthcare complexity, Saviano et al. empathized the need for coupling and balancing its traditional targets of efficiency and effectiveness with sustainability, in order to boost the viability of the whole health service system. It follows that the traditional principles at the core of business practices, based on a problem-solving oriented approach, are still aimed at solving just one short-term priority after another, without a strategic orientation and a clear sense of direction.

Therefore, a new approach to the different interests and goals is needed, as well as to the number of intricate and non-linear interactions occurring between individuals, organizations and institutions, which populate the healthcare service system and which often generate unexpected outcomes. In fact, even though healthcare remains mostly focused on mere operational efficiency, trying to be compliant with the expectations of political and institutional supra-systems, a new orientation is rising. This is aimed at also meeting service effectiveness, and therefore, at changing the role of patients as well as at combining resources in a more sustainable way. This new orientation calls for a radical change in service providers’ mind-set, who should be focused on better satisfying patients, moving from the traditional doctor-patient relationship toward a provider–client relationship.

Two essential concepts at the core of the health provider–client relationship, as well as of the recent healthcare general reformation, are the empowerment of patients and the patient-centred approach to care. These two concepts are based on the exploitation of the patients’ ability to always improve their self-reliance and competence with disease, making them able to actively participate in health service provision. This has led beyond the enduring information asymmetry that traditionally affects physician–patient relationships. More in details, information asymmetry is mainly due to patients’ dependence on the providers of care, which constrains the mutual and future-oriented use of resources needed for healthcare sustainable development. This is at the core of sustainable development for healthcare.

In fact, being a dissonant interpretation of schemes and categorical values, information asymmetry, together with patients and health professionals’ inability or unwillingness to share their personal resources (information), might prevent the (co)creation of value for the whole healthcare service system, leading, in turn, to the destruction of it. Thus, the sustainability of healthcare service systems can benefit by the actors’ willingness to align their strategies and, at the same time, to always adjust and adapt themselves and their behaviour to the contextual changes. In this direction, the recent advancements of ICTs and the rising implementation of digital platforms has further boosted the empowerment of patients and the progressive overcoming of the aforementioned information asymmetry, enhancing the interaction between health professionals, patients and other people (e.g., families, peers, citizens, institutions, etc.).[2]

**Why is Sustainable Healthcare important?**

Failure to transition to a model of sustainable healthcare will only serve to increase the environmental impact of the healthcare sector. Population growth, unhealthy lifestyles, increases in chronic disease, ageing populations and increased access to healthcare are all expected to drive increases in healthcare demands and resource consumption in the coming decades. When this is combined with the anticipated healthcare impacts linked to climate change, the need for sustainable transformation becomes clearer and more urgent.[2]

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

1. **Practice Chemical Safety**

Chemicals used in LCD displays, fluorescent lamps, CRT monitors, flame-retardant mattresses, wheelchair cushions and even baby bottles can turn out to be hazardous. Hospitals must make conscious purchasing decisions and recycle toxic products periodically.

1. **Follow Waste Disposal Protocols**

Disinfecting medical waste can prove to be an energy intensive process known to release noxious fumes. Healthcare providers must consider moving to greener ways of waste disposal such as autoclaving, chemical treatment and microwaving.

1. **Save Energy**

Saving energy and carbon output may seem like impossible task, but not if the hospital reprograms their heating and cooling plants, re-engineers air handling systems and upgrades lighting systems to begin with.

1. **Preserve Water**

Healthcare providers can save over millions of gallons of water per year simply by replacing washroom toilets, faucets and showers with water-efficient alternatives and purchasing high-efficiency dishwashers.

Every effort taken to strengthen environmental sustainability in healthcare systems can succeed only with the active engagement and collaboration of an engaged workforce. The system must actively engage health care workers in the process of creating, implementing and managing the environmental sustainability measures, while instilling a sense of ownership and responsibility in them. Through a growing network of 1500+ employees, 1200+ channel partners and nine world-class manufacturing units spread across the world, Trivitron Healthcare has been committed to a sustainable business model that delivers value by offering best available health technology solutions for millions of people worldwide.[3]

**Advancement of Environmental Sustainability in Healthcare:**

Pollution is a leading cause of morbidity and mortality, globally responsible for 9 million premature deaths in 2015 or 16% of all deaths (Landrigan et al., 2018). Most of these environmentally-mediated deaths are presently linked to air pollution, responsible for 1 in 8 deaths globally (Cohen et al., 2017).

Focusing on sustainability efforts within healthcare delivery, specifically clinical care, has the potential to engage health professionals. Health professional leadership can then serve as a force multiplier to engage administrators, policy makers, as well as the patients served, to more urgently address pollution threats to health and well-being globally.

**III. APPROACH:**

The aims of this narrative review were to describe the scope of healthcare sustainability research, identify research gaps, suggest an emerging framework for research methods and tools, and identify research priorities to help foster improvement in the environmental performance of healthcare services. For the purposes of this review, sustainability was defined using Our Common Future (Brundtland, 1987), and the common frameworks of the Triple Bottom Line (Elkington, 1999).

**HEALTHCARE EMISSIONS RESEARCH:**

There are growing efforts internationally to measure and mitigate healthcare environmental emissions, with particular emphasis on greenhouse gases (World Bank, 2017; World Health Organization, 2017; Watts et al., 2017). In 2009, the United Kingdom Sustainable Development Unit first reported its National Health Service (NHS) England greenhouse gas emissions, and now publishes updates every 2-3 years (Sustainable Development Unit, 2018). After instituting a national-level benchmarking system, NHS CREATING AND INTEGRATING SUSTAINABILITY METRICS INTO EXISTING PERFORMANCE IMPROVEMENT REPORTING SYSTEMS:

Development of a robust, standardized set of metrics that define environmental performance and gauge progress is required to optimize performance, and metrics must be normalized to allow for meaningful comparisons (Mortimer 2018a). This must be accomplished on multiple scales, including for individual products, clinical care pathways, providers, entire hospitals and health systems, and national healthcare sectors.

**IV. EDUCATION:**

* **COMMUNICATING CLINICAL SUSTAINABILITY:**

For many health professionals, the leading barrier to workplace-based environmental stewardship is a lack of knowledge and skills (Safety, 2016; Safety, 2014a, 2014b; Thiel, 2017). Continuing education and quality improvement project requirements in the area of clinical sustainability (Mortimer, 2018a, 2018b) are driving specialty-specific post-graduate education opportunities through professional societies.

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

Currently, healthcare pollution is causing indirect public health damages and increasing healthcare service needs. A transformational vision is required to achieve a sustainable healthcare system and reach ambitious targets such as those set forth by the Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change, 2018) and the UN SDGs (United Nations, 2020) within the short time horizon mandated by the urgency of global environmental change.[3]

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

The definition was expanded in 2007 as follows: “A good health financing system raises adequate funds for health, so that people can use needed services protected from financial catastrophe or impoverishment associated with having to pay for them. It provides incentives for providers and users to be efficient”.

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

The evolution of health financing during the last half century reveals a fundamental shift in core issues. After 1950, health systems were designed for populations expected to live for an average of 65–70 years. With retirement at 60–65 and near full employment, lifetime earnings and savings were more or less sufficient to finance a decent health system, while rising health expenditure meant welfare gains for all. In the 21st century, average life expectancy rose above the age of 80, and health science and technology improved quality of life even at a very old age. Although desirable, the prolongation of life in good health costs, a reality that no democratic society can ignore for long.

The real political, economic and ethical question is the source of the required financing. Very rich countries can still afford to rely largely on private health insurance despite the serious equity issues involved. Most developed and developing countries, however, finance their more or less developed welfare state through taxation and labor contributions. It is in these countries that globalization is bringing increasing economic inequality and economic uncertainty has caused a major debate on the sustainability of health financing.

**VI. GLOBALIZATION AND INCOME INEQUALITY:**

Globalization has profoundly affected the distribution of income both among and within countries. The seminal work of Thomas Piketty in 2014 showed that globalization favours capital relative to other sources of income, such as labor and rents. Increased capital mobility pulled many countries out of poverty, but the benefits favour the rich capital owning countries. Globalization also increased income inequality within countries with top income brackets absorbing a larger share of national GDP. Besides being a moral and political question, growing inequality is also an economic one since, beyond a certain point, it can be a source of significant economic ills. For example, the failure to tax income reduces the effectiveness of welfare and safety nets and undermines the competitiveness of the economy. This point is particularly important for developing countries now developing their health systems.[4]

* **Recession and Economic Uncertainty:**

Another phenomenon that makes this century different is frequent recessions as income inequality causes a drop in demand. Unemployment and economic distress put a strain on public budgets, increase the demand for public health services, and limit access to private services. Such extreme pressures, as after the 2008-economic crisis, introduced financial sustainability in the health policy debate. Although the debate is still cantered on funding and value for money, it now includes the ability of a society to fulfil its implicit or explicit promise to satisfy need-based demand for health care.

* **Financing Sustainable Health Care:**

The answer to the question of who must pay for health care and how lies in the moral fabric and the value system of a society. It is a deeply ideological and political question with undertones of social involvement, personal responsibility, and freedom of choice. Big changes in health care financing happen rarely, usually after major events and are more likely to take place in countries with social cohesion high on their value scale. This is possibly why discussions on health system sustainability continue to “finesse” the question of financing, and perhaps to avoid two uncomfortable truths. One, that reliance on out-of-pocket expenditure is not acceptable on equity and financial protection grounds. Two, that only some kind of income transfer, such as taxation, can cover the increasing cost of health care.

The moral determinant of “who pays” and “how” must now gain importance, as ageing societies, technological advances, globalization, and economic recessions put a strain on the sustainability of financing sources. The question therefore should now focus, not only on whether society as a whole will bear the cost but also on how to obtain and manage the needed savings, and on the efficiency and competitiveness of the economy which must produce them.

For the increasing cost of care many “blame” the demographic factor, although the major part of life-time health cost occurs in the last two years of life. Life expectancy indeed rose significantly in the last fifty years together with total lifetime cost. The average retirement age, however, remained more or less the same at around 65. There are, therefore, twenty years in which a citizen incurs health costs without producing income as “insurance”. People of working age today must finance the health needs of their children, themselves and, mainly, the 3rd and 4th generation. Labour contributions legislated thirty years ago are clearly not enough for today’s medical costs, while contributions sufficient to cover health costs thirty years from now would make labour extremely expensive. Therefore, only savings in the form of taxes on all incomes produced by society, including wealth and capital, appear to be a sustainable source of funding in the long-term.[4]

In addition, cyclical fluctuations are now common events rather than rare occurrences. Health financing may determine how pressures on health systems are weathered without loss of equity, quality and financial protection. Social Health Insurance has been found to have negative labour market effects and to hurt competitiveness due to higher labour costs. This is crucial in monetary unions where devaluation during economic crises is not an option and competitiveness gains are the only way for the economy to adjust to pre-crisis levels. In addition, as unemployment increases, incomes decline and pressures on health budget and public infrastructure are pushed to extremes, evidence has indicated that public health systems financed through taxation can be more responsive to economic pressures and more effective in health expenditure consolidation. Although conclusive evidence is lacking, the experiences of Canada and Greece may be indicative.

Evidence from Canada, where health is financed mainly through taxation, suggests that patient satisfaction, hospital performance and health outcomes were maintained despite the financial strain. Concerns that reliance on taxation may be associated with higher private payments, especially during economic downturns, or that corruption may inhibit administrative capacity to collect taxes, may be put to rest by the fact that during economic turmoil individuals become more price-sensitive and administrative capacity tends to improve.

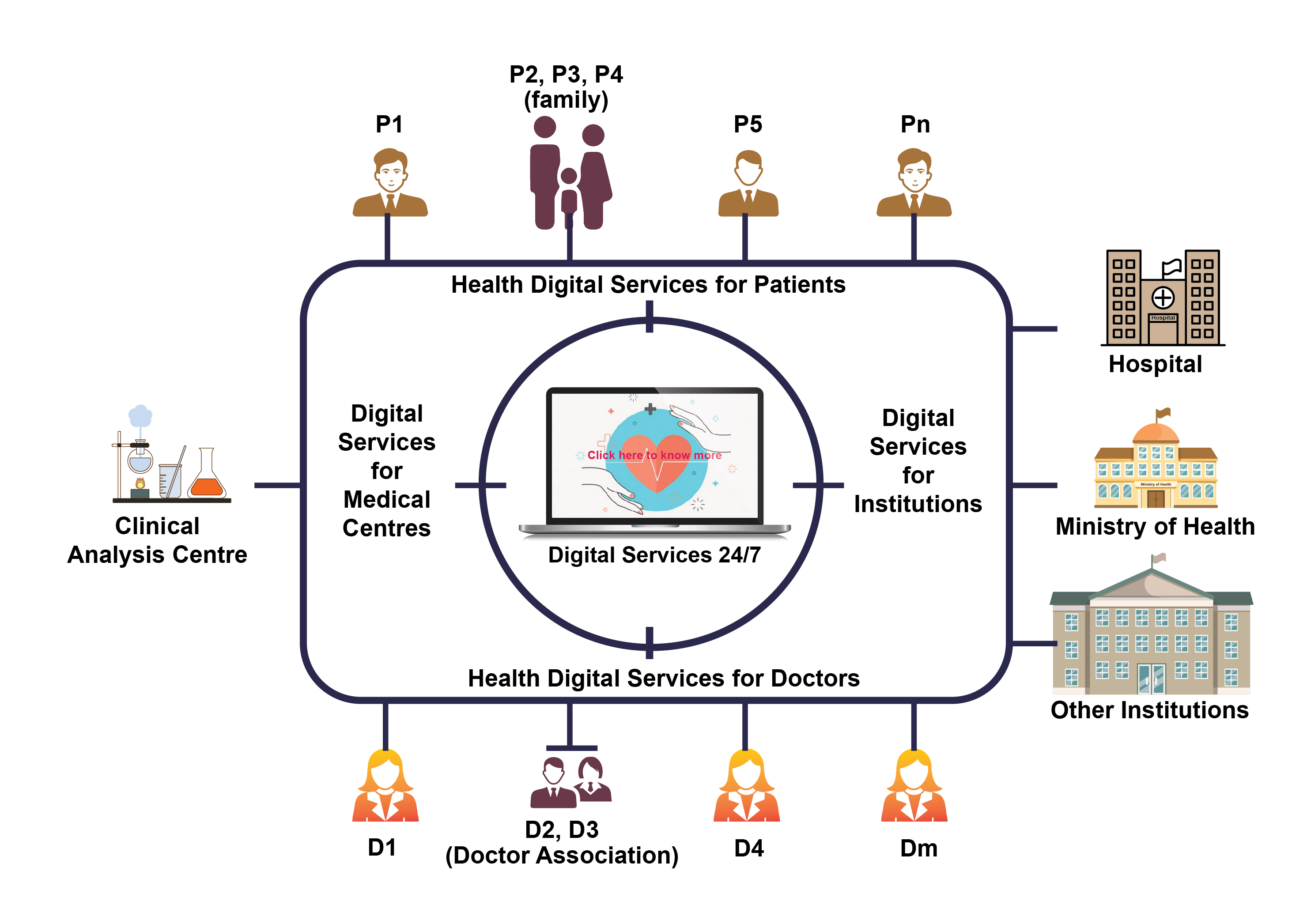
In Greece, Social Insurance historically covered approximately 40 % of health care cost. In the face of severe unemployment (27 %) caused by 25 % GDP contraction, reliance on employer-employee contributions proved an inadequate funding base for health care. Between 2009 and 2012, Social Insurance expenditure declined by 29.3 %, with the fairness of the system and quality of care severely affected. Greece is now a country where the need of re-orientation of health care financing is pressing.

In conclusion, employment contributions as a source of health financing are incompatible with universal coverage, quality of services, and rising life expectancy. A move towards general taxation to meet health care needs can boost economic growth through increased competitiveness, and achieve major non-health objectives, like equity, financial protection, quality and responsiveness even during economic downturns. Health system sustainability, as a system objective, must turn to financing through progressive taxation of all types of income. “Uncomfortable” as this may appear, it is a reality not to be overlooked. Political concerns associated with economic imperatives as well as moral considerations may force changes in health services financing in both the developed and developing world. National health insurance financed through taxation should gain momentum in the quest for more sustainable and responsive health systems.

**VII. PURSUING SUSTAINABILITY FOR HEALTHCARE THROUGH DIGITAL PLATFORMS:**

**Designing and Implementing a Digital Platform for Healthcare Services Sustainability:**

Drawing on the interaction type meta-model, a prototype digital platform, Digital Services 24/7, has been developed to better understand the way a digital application can boost the interactions usually occurring between doctors, patients and all the other actors that populate healthcare systems (e.g., hospitals, private clinics, clinical analysis centres, Ministry of Health, other health institutions, etc.).



Being built upon the results of a long-term research project, Digital Services 24/7 main functions are: connecting physicians who work as freelancers with patients in a single application context; offering a complete set of digital services (e.g., booking, visit/report, follow up, etc.); provide an authorized access to health-related data to patients, physicians, public institutions and private health organizations; maintaining a single database, which can be used for predictive analysis through machine learning algorithms; integrating the existing or future digital, and even wearable, devices for data recording and analysis.

As stated, Digital Services 24/7 being designed on the logical foundations of the interaction-type meta-model described in the previous section, aims to facilitate actors’ interactions and, therefore, mutual information-sharing, fundamental for offering updated and personalized health service and for improving health-related processes, is ongoing. In this direction, depicts the top-level architecture of Digital Services 24/7 in order to offer a better understanding of the possible interactions that the digital platform can enable between different actors or active entities.

**VIII. SUSTAINABILITY IN HEALTHCARE:**

The Department of Health recognises the link between the health and wellbeing of Victorians and the health and wellbeing of the environment. We are committed to improving sustainability within health system infrastructure and performance. This commitment is documented in our Environmental sustainability strategy 2018–19 to 2022–23.

To support its implementation, we have published a strategic implementation plan and 2021-22 action plan and progress report and sustainability performance report on implementing our agreed actions. Within this context, this section of the website focuses on improving the environmental performance of the health system.

To view sustainable healthcare as "healthcare that delivers high quality care in an affordable way, while minimising the impact on the environment". It describes a system that meets the health needs of the present, without compromising the health of future generations.

Sustainable healthcare is about understanding that our health – and that of our environment around us – are intrinsically linked, and acting in a way that supports both people and planet health.

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

**1. Sustainable prevention**

Keeping people as healthy as possible for as long as possible – and empowering them to take an active role in their health and wellbeing – reduces the risk of them becoming unwell or needing to receive treatment and consume healthcare resources in the first place.

Focusing on primary prevention (health and lifestyle), secondary prevention (screening to identify disease in its earliest stage) and tertiary prevention (reducing the effects of established disease) can deliver both near-term and long-term sustainability benefits through lower healthcare consumption.[5]

**2. Sustainable pathways**

When access to healthcare services is required, simplifying access routes and catching diseases in their earliest stages are often associated with less resource-intensive treatment.

By getting people to the right service at the right time and making healthcare pathways more efficient and joined-up (for example, by implementing initiatives such as digital triage and "one-stop" diagnostic clinics) you can reduce healthcare’s environmental footprint through reductions in patient travel and removing the unnecessary or duplicated tests that are often found in fragmented healthcare systems.

**3. Sustainable practice**

When care or treatment is being delivered to patients it is vital that the carbon footprint and wider environmental impacts of are kept to a minimum. This can be achieved by minimising the emissions or resources required to deliver high quality health outcomes, for example, reducing waste associated with procedures, using more sustainable products/materials or reusing equipment where clinically appropriate.

Minimising the environmental impact of care must not compromise the health outcomes or quality of care, so it is important for organisations and healthcare professionals to collect data that can demonstrate both the clinical effectiveness and environmental impacts of practice.

**IX. HEALTH CARE SUSTAINABILITY METRICS:**

**Building a Safer, Low-Carbon Health System:**

As understanding grows of the scale of health care’s environmental impacts, so too does interest in measuring and reporting on sustainability as a facet of health care system performance. This article examines important lessons from health care’s long experience with performance and quality measurement and reporting that can be applied to the creation of health care sustainability metrics. Although some large health systems such as Kaiser Permanente have invested heavily in environmental stewardship, in the US the focus of health care sustainability measurement and reporting has typically been on corporate social responsibility and climate risk disclosure. The ability of health care organizations to generate data on and control environmental impacts can be limited by legacy infrastructure and complex supply chains. However, just as in other domains of performance, health care sustainability measurement and reporting must proceed from a clear conceptual framework and statement of purpose. Measurement must reflect strategic goals, instead of letting goals become dictated by ease of measurement. Health system leaders now need to set clear and compelling sustainability goals, invest in internationally comparable metrics by which to measure their success, and embed them in their core business.

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

The health sector’s contribution to damaging and degrading the natural environment has become increasingly clear in recent years. A 2019 estimate places health care’s global carbon footprint at 4.4 percent of the world’s total greenhouse gas emissions, whereas health expenditure accounts for some 10 percent of global economic output. Health care generates 1–5 percent of total global environmental impacts in the domains of greenhouse gas emissions, particulate matter, nitrogen oxides, sulphur dioxide, increased malaria risk, nitrogen runoff, and use of scarce water. Pollution from health care directly damages human health, with estimates suggesting that it causes a substantial burden of disease. National-level estimates suggest that the health care sector is responsible for between 7.9 percent and 9.8 percent of national greenhouse gas emissions in the US. Some countries are now moving to include their health care systems in their plans to meet their commitments under the Paris Agreement on climate change mitigation. For example, the UK recently announced its commitment for the National Health Service (NHS) in England to become carbon “net zero” by 2040.

Interest is therefore growing in how health care organizations and systems might better measure and report on their sustainability and environmental performance.[7](https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01103#B7) Health care sustainability reporting aims to build a safe, low-carbon health system through the use of effective metrics. We consider the growing need for better reporting of the environmental impacts of health care in light of lessons from health care quality improvement and performance reporting.[5]

**Health Care Performance and Quality Improvement Evolution and Approaches:**

Although “performance” measurement and reporting in health care may cover various aspects of health services (for example, patient access, costs and efficiency, and so on), in recent decades there has been an explosion in the use and reporting of measures of clinical and service quality. Two principal approaches to the use of performance and quality measures in improving health care have been identified: using quality indicators as summative measures of performance for purposes of external accountability or using them as formative mechanisms to support internal processes of quality improvement. There are two basic goals for any performance measurement instrument in health care: promoting accountability and improving health system performance. Performance and quality measurement serves many stakeholders with different needs: governments, regulators, funders, purchasing organizations, provider organizations, physicians, patients, and citizens.

Objectives for reporting on health care performance and quality have included accountability and transparency (to the public, health care funders, and regulators), supporting improvement within organizations, aligning the objectives of stakeholders and “norming” desired behaviours and priorities, supporting and spurring improvement through provision of comparative or benchmarking data across organizations, and incentivizing improvement and value through linking payment to performance.

Reporting performance measures may lead to change and improvement through four different pathways: change, in which providers use information to improve their own performance; selection, where users or purchasers switch providers based on information; pay-for-performance, where providers are financially rewarded for superior measured performance; and reputational damage, or “naming and shaming” poor performers. Measurement and reporting are two distinct activities: Not everything that is measured should necessarily be reported.

**X. EXPERIENCE AND LESSONS:**

Although a vast literature now exists on health care quality and performance measures, data sources, and statistical techniques, perhaps the most influential conceptual approach to measurement remains one of the oldest: *Avedis Donabedian’s* typology of measurement across structure, process, and outcome measures. *Donabedian’s* framework concerns the structural context (for example, physical, organizational, and institutional) of care delivery; process, or the actions undertaken by all parties; and outcomes, or the ultimate effects on patients and populations. Years of experience in applying these approaches have yielded important lessons on how best to design and implement quality and performance measurement systems.

Tension exists between the use of performance measures for external assessment and for internal quality improvement purposes and between the approaches most suited to each of the four pathways of change. Performance and quality information is a public good that will not evolve spontaneously without active stewardship and guidance by governments and that requires careful investment and attention. System-level performance measurement requires a clear conceptual framework that not only covers all major domains of the health system but also aligns with its objectives, integrates with its information technology systems and data collection infrastructure, captures high-priority but hard-to-measure areas, and is designed for international comparability.

**XI. THE ENVIRONMENTAL SUSTAINABILITY OF HEALTH CARE:**

1. **Purpose, Context, and Governance:**

The technical ability to measure the environmental impacts of health care has also grown rapidly. A fast-growing research literature explores the carbon footprint of different aspects of health services ranging from global and national health systems, hospitals and hospital services, and anaesthetic gases to individual devices and consumables. More broadly, a recent study of the global environmental footprint of health care for the first time estimated worldwide greenhouse gas emissions, particulate matter, NO2 and SO2 emissions, malaria risk, nitrogen to water pollution, and the use of scarce water by national health systems. Yet this literature is heavily skewed toward greenhouse gas emissions; although several other environmental harms (for example, pollution from the release of pharmaceuticals into the environment) are significant, analysis of them lags far behind. Moreover, the availability of technical measures (especially those developed for research purposes) should not be confused with their suitability for use as performance reporting metrics. A health care sustainability metric needs to fulfil functions analogous to those laid out above for health care quality measures if it is to be useful, which many technically exact measures might not be capable of supporting meaningfully.

A number of different approaches to environmental reporting in health care already exist internationally, reflecting underlying differences between health systems and the purpose that environmental reporting seeks to fulfil (see online appendix table 1 for a summary).[6]

1. **Climate Risk Disclosure:**

Corporate climate-related risk disclosure has grown rapidly in recent years as key investors have demanded greater disclosure of corporations’ vulnerability to a range of climate change risks. Some large health care providers and insurers and many pharmaceutical, medical device, and supply firms already participate in voluntary disclosure initiatives such as the Carbon Disclosure Project. The Bank for International Settlements’ Financial Stability Board established a Task Force on Climate-Related Financial Disclosures recommending that organizations in all sectors of the economy voluntarily undertake routine disclosure of their climate risk governance, strategy and risk-management activities, and relevant metrics and targets. The International Monetary Fund has recently gone further, recommending the development of global, mandatory disclosures on material climate change risks for corporations in all sectors. This approach seeks explicitly to make organizations identify their vulnerabilities to climate risk in the widest sense, not just to report on carbon dioxide–equivalent (CO2e) emissions.

1. **Corporate Social Responsibility Reporting:**

US health care may be behind the curve in reporting on sustainability. *Emily Senay* and *Philip Landrigan* have described the extent to which large US health care corporations undertake sustainability reporting through their corporate social responsibility reports or activities; they found that health care lagged substantially behind other economic sectors in terms of the proportion of corporations (whether for profit or non-profit) publishing sustainability data. This is important because in the US health care setting, most attention to date has focused on the inclusion of environmental impacts within corporate social responsibility reporting by large health care organizations and on corporate participation in sustainability initiatives such as the Healthier Hospitals Initiative.

Various organizational arguments (for example, the absence of shareholder pressure on health care organizations) have been suggested to explain this finding. Others have suggested the existence of a form of “moral offset”—that is, health care organizations’ obviously beneficent healing mission may reduce their sense of obligation to undertake corporate social responsibility or sustainability reporting. Yet more than 1,200 US hospitals had enrolled in the Healthier Hospitals Initiative by 2018.Jodi Sherman and Robert Lagasse argue that this level of participation in benchmarking and sustainability improvement activities shows a growing level of commitment on the part of health care organizations.

1. **Publicly Mandated Reporting:**

One of the most comprehensive approaches to health care environmental sustainability reporting in the world is NHS England’s new Sustainable Health Dashboard. This dashboard provides performance data for every NHS provider, clinical commissioning group, and region in England on a range of indicators in the domains of governance; carbon; resources, water, and waste; air pollution; plastics; and adaptation. Unified accountability and funding mechanisms make it possible for NHS England to mandate collection and reporting of these data, with central investment and support provided to establish this system. More typical of international efforts are the more modest reporting requirements for public health services in the Australian state of Victoria.

All public health services are required under state government funding policy to report a standardized set of environmental impact measures, either in their annual report or on a standalone sustainability report. Measures include energy use, greenhouse gas emissions, water use, and waste generation, both totals and rates (for example, per square meter of floor space or per patient separation or admission). Clearly, the UK and Australian health care systems display deep structural differences from the US health care system, yet their experience is significant, not least because there have been calls for sustainability metrics to be integrated into Medicare’s Quality Payment Program, shifting health care sustainability from a private corporate concern into one of public policy.

Perhaps the most salient lesson from the English and Victorian experience is that progress on health care sustainability reporting has grown over time, supported by an organic web of legislation, strategy, and preparatory activities and driven by strategic purpose. Appendix figure 1 briefly summarizes some of this supporting legislation and regulations in the case of Victoria, showing how the specific public health care reporting framework grows out of the state’s Climate Change Act, which itself is motivated by the Paris Agreement’s international commitment to 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 approaches. Health care quality reporting, for example, requires quite different approaches at different levels, ranging from whole health systems down to individual services, wards, or clinicians. A whole health service might generate internal benchmarking reports or performance league tables across multiple units or services, whereas public accountability, pay-for-performance, or corporate social responsibility reporting might be more likely to take place at the level of the whole organization. Health care environmental reporting must consider systematically and logically the most appropriate approach to the scope and level of reporting, driven by a clear strategy.

**XIII. SCOPE OF MEASUREMENT AND CONTROL:**

Measuring greenhouse gas emissions for performance purposes is complicated by the differing ability of individual health care providers or teams to affect emissions incurred along the entire value chain of health care products. Following the guidance of the Greenhouse Gas Protocol, greenhouse gas emissions are divided into three categories: Scope 1, Scope 2, and Scope 3 CO2e emissions. Each Scope refers to categories of emissions emitted directly by the health service (Scope 1), indirectly from purchased energy (Scope 2), or indirectly from other points in the supply chain (Scope 3).

[**Exhibit: 1**](https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01103#EX1) **- Describes the allocation of emissions across these Scopes.**

| **Emissions Scope** | **Definitions and covered activities** |
| --- | --- |
| **Scope 1** | Direct emissions from combustion of fossil fuels by the health service to provide energy, including health facility operation (natural gas, liquefied petroleum gas, diesel), fuel use by leased or owned corporate and patient transport vehicle fleet, refrigerants, and medical gases. |
| **Scope 2** | Indirect emissions from consumption of purchased energy generated upstream from the health service, including electricity supply, purchased steam, purchased chilled water, and district heating and cooling. |
| **Scope 3** | Indirect emissions that are a consequence of the health service but are not directly controlled by it, including upstream: capital works; purchased or leased equipment; purchased consumables, devices, and pharmaceuticals; and purchased services (for example, linen, pathology, data centres); upstream and downstream: buildings leased from private sector (energy use), business travel, staff and visitor transport, emergency and nonemergency patient transport, and embedded retail operations; and downstream: aids and appliances for home-based care and waste management. |

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

The ability to influence different CO2e emissions Scopes varies significantly between and within health care organizations. For example, an individual clinical service (for example, cardiology) may have little direct influence over Scope 1 or 2 emissions, but they might have significant opportunity to influence decision making over the purchasing of clinical equipment and drugs (Scope 3 emissions). The anaesthesiology division might be expected to have considerable say in the choice of aesthetic gases purchased (Scope 1), operating room energy use (Scope 2), and the use of certain supplies (Scope 3). The importance of Scope 3 emissions through procurement (particularly of pharmaceuticals) has been repeatedly emphasized, and clinical services (and even key individual clinicians) might exert significant control over procurement decisions over specific clinical supplies. If control can reasonably be exercised, then the inclusion of Scope 3 emissions from procurement could be measured and reported at the service level, not just the institution level. Yet the measurement of Scope 3 emissions involves the complex aggregation of many products and services across the whole supply chain and presupposes sourcing relevant supplier data.

Electricity is typically the main component of Scope 2 emissions, and most health services purchase their electricity from a local utility grid. Health services could install their own renewable generation capacity or seek to purchase renewably generated electricity from alternative grid suppliers. The sheer size of the health sector (17 percent of US gross domestic product) means that it has the potential to exert significant leverage on energy providers if health systems act in concert. However, the generation source of the local electricity grid is frequently not directly under an individual hospital’s control. In Australia in 2019, only 14 percent of electricity generation in Queensland was from renewable sources, rising to 23.9 percent in Victoria; in contrast, fully 95.6 percent of electricity generation in Tasmania was from renewable (hydro) sources. Thus, a hospital in Tasmania that was identical in every other respect to a counterpart in Queensland would record Scope 2 emissions that were six times lower simply by the good fortune of its location.

Clarity on what health care sustainability reporting seeks to achieve is essential, as is a clear purpose on the relative priority assigned to improvement or accountability goals. If the purpose of reporting on gas emissions performance is to capture a “like for like” comparison of factors under the control of the health service, statistical adjustment for the renewables content of the local electricity supply would be appropriate; doing so would be analogous to using risk or case-mix adjustments in clinical measures to control for differences in risk in underlying populations. If the purpose of reporting is to drive improvement, statistical adjustment for such factors would not be appropriate, in order to sharpen incentives for health services to decarbonize their energy supply.

**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 Boone provides 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 system wide sustainability reporting to support both accountability and improvement.

| [**Exhibit: 1**](https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01103#EX1) **- 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:**

1. **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 non mandatory 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:**

Quality improvement tools offer a simple way to operationalise the knowledge and skills for the transition to a sustainable health system. Quality improvement is a means to continuously and systematically improve patient outcomes and system performance, and over the last decade it has been integrated into health professions education as core curriculum content and professional standards for practice across disciplines for undergraduate degrees to postgraduate training programmes.

Health system quality improvement requires a systematic approach of designing, testing, and implementing change concurrently with real-time impact measurement, as is offered by quality improvement methodology.

Integrating sustainability into quality improvement offers a practical way to address environmental challenges in health care as a core part of professional practice, and coupling it to a recognised method for change can facilitate a systematic process of workforce upskilling.

Improvement in health care is informed by domains of quality, defined as patient experience, safety, effectiveness, efficiency, equity, and timeliness. Sustainability is a domain of quality which must “run through and moderate other domains”, as health care should consider what can be delivered both for patients today, for the population in general, and for future populations.

Sustainability in quality improvement (Sus QI) is a pioneering framework that embeds environmental, social, and economical sustainability into established quality improvement methodology. It is defined as “an approach to improving health care in a holistic way, by assessing quality and value through the lens of a ‘triple bottom line’” (equation adapted from Mortimer etc., SUSTAINABLE VALUE = Outcomes for Patients and Populations environmental + Social + Financial Impacts (The ‘Triple Bottom Line’).

This means that the health outcomes for patients and populations from a system, service, or process in health care are weighed against its environmental, social, and financial impacts to determine its overall sustainable value. The application of the triple bottom line to design and evaluate health outcomes provides a consistent conceptual framework for broadening the scope of health care quality improvement.

This framework equips the transition towards sustainable health care in three important ways: first, it widens the concept of cost to extend beyond the financial and introduces environmental and social resources as rationalisable components of the system; second, it indicates that even high-value outcomes will not be sustainable if environmental, social and financial resources are exceeded; and third, it implies that environmental impacts are a measure of value and it requires new skills in carbon foot printing in order to meet decarbonisation targets.

Sus QI follows a four-step framework which integrates social and environmental sustainability into established quality improvement methodology, in order to direct change towards the highest-value improvements. The Sus QI approach enables the transition to sustainable health care by centring change on reducing health-care activity and reducing the carbon intensity of that activity. The framework then generates change ideas by framing them within the principles of sustainable clinical practice of prevention, patient empowerment and self-care, lean pathways, and low-carbon alternatives. [9]

Sus QI projects undertaken by health-care staff across the UK have achieved triple-bottom-line improvements through reducing the use of nitrous oxide in operating theatres, reducing duplicate medication ordering, reducing the carbon emissions associated with metered-dose inhaler use by switching to lower-carbon inhalers and improving inhaler disposal, reducing inappropriate and unnecessary cannula use in emergency departments, and using nature-based interventions such as green walking in inpatient psychiatric units.

Many of these projects have seen substantial carbon reductions as well as financial savings. One team estimated savings of over £78 000 as well as yearly reductions of 107 tonnes of CO2 emission—equivalent to almost 308 000 miles driven in a car—by using an innovative gasless technology for performing appendix removal surgery. Another team who implemented early mobilisation of patients in a cardiac intensive care unit estimated carbon savings of 50 tonnes CO2 emissions and financial savings of over £1·2 million over 2 years from reduced lengths of stay.

**XVII. SUSTAINABLE QUALITY IMPROVEMENT IN EDUCATION:**

Given that quality improvement is an increasingly common feature in health professions education, this presents a ripe opportunity for integrating sustainability into the curriculum in a meaningful and practical way. The Sus QI framework has been introduced to a number of health-care education and training programmes across the UK. It has been included in postgraduate training curriculum for doctors in England as part of an initiative to improve the generalist skills of doctors for working within a system of increasing complexity.

Sus QI education can be carried out through interactive workshops, online self-study, or the use of online teaching materials that introduce the concept, framework, and technical skills (e.g., carbon calculation) for carrying out Sus QI projects. In university settings, learners are often tasked with writing a project proposal or undertaking a sustainable quality improvement project within their clinical setting. The primary approach to teaching Sus QI is in demonstrating how embedding sustainability adds value to the established quality improvement process. The aim of a Sus QI session teaching would be for students to understand how to integrate sustainability concepts into each stage of their quality improvement project or work. In this way, core knowledge and skills for sustainable health care are practically taught and applied.

The table provides examples of how each step of the Sus QI framework can enable learners to gain core knowledge and skills in sustainable health care.

**Table: Core sustainable healthcare knowledge and skills gained through Sus QI education**

|  | **Core knowledge and skills of sustainable health care gained** | **Example educational activity** | |
| --- | --- | --- | --- |
| **Step one (1): Setting goals** | Understand the elements of the triple bottom line and how this defines health-care quality; use the triple bottom line to frame the overarching goal of a quality improvement process | | Set out how each aspect of the triple bottom line will be embedded into each step of your project to reduce hospital admissions in a patient group | |
| **Step two (2): Study the system** | Identify the environmental, economic, and social resources used in health care; identify carbon hotspots; understand where resources can be reduced or avoided; understand the social impacts of health care on patients and their families, staff, the wider community, and vulnerable groups | | Use a process map to identify areas of excessive environmental, economical, and social resources when a patient is admitted to your department | |
| **Step three (3): Design the improvement** | Understand the principles of sustainable clinical practice of prevention, patient empowerment and self-care, lean pathways and low-carbon alternatives; understand how the principles drive improvement efforts towards the highest value interventions | | Use a driver diagram to generate a change idea based on each of the principles of sustainable clinical practice to improve the problem of delayed discharges in your department | |
| **Step four (4): measure the impact** | Understand how to identify and measure environmental, economic, and social resources; understand carbon foot printing, and be able to perform simple carbon calculations | | Calculate the carbon emissions saved after introducing an online consultation service; also measure the social impact of this service on patients, staff, and the wider community | |

*Sus QI = sustainability in quality improvement.*

Embedding Sus QI into undergraduate and postgraduate health professions education has been shown to increase learners’ motivation and engagement for both quality improvement and sustainable health care. Clery and colleagues showed that when Sus QI was taught to undergraduate medical students at the University of Bristol, Bristol, UK, 95·0% of students who completed post-teaching session questionnaires (n=121) agreed that quality improvement projects with a sustainability focus are important for health care and 94·2% agreed they were likely to take action to reduce the environmental impact and carbon emissions of their future clinical work.

Spooner and colleagues, in a multicentre, cross-discipline study of Sus QI teaching, showed that learners describe a transformational shift in their thinking about the importance of both quality improvement and sustainability, and are able to reframe themselves as agents of health system change.

This study also confirmed the motivation among health-care professionals and students to take action on climate change identified in previous studies, with those most motivated by environmental issues demonstrating the highest rates of intention to apply Sus QI concepts in their clinical practice.

In short, evidence is accumulating to suggest that the Sus QI framework offers students and clinicians the opportunity to operationalise planetary health concepts as part of their clinical practice. Sus QI can therefore address the current skills gap in health-care education for the transition towards environmentally sustainable health-care systems. Health-care institutions and educators who embed Sus QI into their curriculum will be able meet the learning needs of a workforce who are increasingly aware of climate change and its impact on health, and are motivated to implement changes to their clinical practice to reduce its negative environmental impact. [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. For a performance measurement reporting system to be meaningful or effective, it requires a clear conceptual framework and purpose. The choice of appropriate technical measurement approaches must proceed from this purpose, instead of allowing measurement availability to drive and distort goals. Avoiding undue focus on more easily measurable greenhouse gas emissions at the expense of other environmental impacts is integral. Maximum impact will be achieved by clearly demonstrating how measures of population health, clinical quality, and environmental sustainability complement and reinforce one another.

Health care sustainability measurement and reporting are two decades behind efforts to improve health care quality through measurement. Given the urgency of achieving real improvements in sustainability, health systems must learn rapidly from the best evidence from decades of quality measurement and reporting. Large-scale change must be achieved in a small fraction of the time that has elapsed since Donabedian began studying quality improvement. To make good this deficit, health system leaders need to focus urgently on the following actions: setting out clear and compelling strategic goals for health care sustainability (perhaps guided by the NHS Net Zero approach); devising, adopting, and implementing internationally comparable, standardized metrics (in partnership with other nations and health systems) that are driven by these goals; and firmly embedding these goals and measures within the mainstream infrastructure of quality improvement, performance, and accountability. [10]

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