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HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

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Abstract

Background: Increasing health costs, demand and patient multi-morbidity challenge the sustainability of healthcare systems. These challenges persist and have been amplified by the global pandemic. We aimed to develop an understanding of how the sustainable performance of healthcare systems (SPHS) has been conceptualised, defined, and measured.

Methods: We conducted a scoping review, of peer reviewed articles and editorials published from database inception to February 2021. We included articles that discussed key focus concepts of SPHS: 1) definitions, 2) measurement, 3) identified challenges, 4) identified solutions for improvement, and 5) scaling up successful solutions to maintain SPHS. After screening procedures, full-text articles were reviewed, and relevant information extracted and synthesised according to the five focus concepts.

Results: Of 142 included articles, 38 (27%) provided a definition of SPHS. Definitions were based mainly on financial sustainability, however, SPHS was more broadly conceptualised and included acceptability to patients and workforce, resilience through adaptation and rapid absorption of evidence and innovations. Measures of SPHS were also predominantly financial, but recent articles proposed more nuanced measures that accounted for financial, social and health outcome outputs. Challenges to achieving SPHS included the increasingly complex patient populations, limited integration because of entrenched fragmented systems and siloed professional groups, and the ongoing translational gaps in evidence-to-practice and policy-to-practice. Reported strategies to improve and sustain SPHS included developing appropriate

organisational and workplace cultures, direct community and consumer involvement, and adoption of evidence-based practice and technologies. There was also a strong identified need for long term monitoring and evaluations to support adaptation of healthcare systems and to anticipate changing needs where possible.

Conclusions: To implement lasting change and to respond to new challenges, we need clear definitions and frameworks, and robust, flexible, and feasible measures to support the long term sustainability and performance of health systems.

Keywords: healthcare system sustainability, sustainable performance of healthcare systems, healthcare services, value in healthcare

Strengths and limitations of this study

- This scoping review addresses a knowledge gap by providing a comprehensive synthesis of the literature including definitions, measurement, challenges, solutions for improvement, and scaling up successful solutions to maintain sustainable performance of health systems (SPHS).
- We were guided by the PRISMA-ScR methodology, searching multiple databases and using complementary snowballing techniques to increase comprehensiveness.
- The use of the Hawker and AACODS quality appraisal tools provided an assessment of the quality of literature on the sustainable performance of healthcare systems.
- We highlight a paucity of uniform definitions and the lack of inclusion of definitions in articles discussing SPHS, which limits interpretation and comparability.

- The review identifies new, more nuanced measures and indicators that include social and health outcomes, moving beyond the more traditionally-used financial outcomes that have dominated the assessment of SPHS.

Background

Globally, health spending is tracking above and beyond economic growth [2]. Core challenges facing healthcare systems include an ageing population and subsequent rise of chronic diseases and multimorbidity [3, 4], and increasingly expensive new medical technologies [4, 5]. It is estimated that approximately 30% of care delivered by healthcare systems is low-value, attributable mainly to administrative overheads, bureaucracy, over-diagnosis, overtreatment or other factors [6]. Systems lacking coordination and integration across clinical disciplines and health sectors also result in wasteful spending through both care duplication and omission of needed care [7]. If health spending follows current trajectories, governments are suggesting that healthcare systems will begin to become unaffordable [4]. This leads us to the question: "what is the current thinking about interventions and initiatives to make healthcare systems more sustainable?" Understanding how health system sustainability is conceptualised underpins the implementation and evaluation of system-wide interventions that aim to improve performance. Although literature about the sustainability of individual innovations and improvement programs is growing [8], the broad question of whole-of-system sustainability is rarely studied.

Sustainability itself has remained an ambiguous topic in the literature. Sustainability suggests that healthcare systems should be built to last, and able to adapt and endure, ensuring that resources are expended efficiently and responsibly to maintain or improve individual and population health and wellbeing [9]. To be sustainable, a healthcare system must adequately deliver across financial, social, and environmental concerns [5]. This triple bottom-line is difficult to achieve consistently over time. For example, sustainable health services may need additional short-term investments to be financially beneficial in the long-term [2].

We define the health system as one that delivers care to those who need it across many different settings. It includes key components: capacity, including physical, capital, and human assets; organisational structure, both formal and informal; finances, including mechanisms for funding allocations, ownership, and solvency; patients or clients and their characteristics and needs; and care processes and infrastructure [10].

Healthcare system sustainability is difficult to measure in practice and requires ongoing long-term monitoring and evaluation of appropriate indicators. One potential way to conceptualise and operationalise sustainability is an assessment of the sustainable performance of healthcare systems (SPHS). Although past reviews have addressed the sustainability of improvement programs and policies in the healthcare system [8, 11, 12], they did not specifically address how SPHS is conceptualised in the medical literature. As a response, the current study was designed using a systems science lens to fill this gap in knowledge by reviewing publications that report on or discuss healthcare system sustainability.

Objectives

This scoping review of health and medical literature aims to develop an understanding of how SPHS has been conceptualised, defined, and measured, and to scope the identified challenges and potential solutions to achieving and maintaining SPHS.

Methods

Study Design

In keeping with scoping review methodology [13], our inclusion criteria were broad and comprehensive to capture the state of knowledge about SPHS. We included literature reviews, primary empirical articles (including qualitative, quantitative, and mixed methods studies), case studies, opinion pieces, and editorials published in English before February 2021. To be included, studies had to report on, or discuss in detail, aspects of healthcare systems sustainability, resilience, or performance improvement, and could cover improvements in cost-effectiveness, affordability, safety, quality, equity, or access, whilst creating or realising value (Table 1). Only articles that addressed the research objectives and provided insights into current knowledge of sustainability in healthcare delivery systems were included. Articles on environmental sustainability; those investigating discrete improvement programs implemented in specific health settings; and studies with a specific focus on COVID-19 were out of scope (Table 1).

Information Sources

In consultation with an experienced university medical librarian, we developed a search strategy using key words and MeSH terms and conducted an advanced search of PubMed and Ovid Medline (Additional File 1). Additional relevant articles were identified by hand searching reference lists of included articles (snowballing).

Study Selection

Guided by the Preferred Reporting Items for Systematic review and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) statement [14, 15], and the methodological framework for scoping reviews [13] (Additional File 3), a preliminary screening of the article titles and abstracts was conducted by four reviewers (JHo, JHe, GD and EM) using the inclusion and exclusion criteria (Table 1, Additional File 4). The full-text review was then conducted by a second

reviewer team (JHe, YZ, GD, IM and GL) in consultation with the first reviewer team (JHo and EM).

Quality Assessment of Individual Studies

Hawker et al.'s Quality Assessment Tool was applied as it enables quality assessment among many different article types including quantitative, qualitative, or mixed-methods empirical research studies or literature reviews [16]. The Quality Assessment Tool contains nine categories (abstract and title; introduction and aims; method and data; sampling; data analysis; ethics and bias; results; transferability or generalizability; and implications and usefulness) and a total quality score can be calculated with a maximum score of 36, where higher scores denote higher quality [16]. Only articles that scored 24 points or above were included in our review [17, 18]. For quality assessment of opinion or commentary pieces, we used the Authority Accuracy Coverage Objectivity Date Significance (AACODS) Checklist [13, 18].

Data Extraction

Characteristics of included articles, year of publication, country of origin, and article type were tabulated. A purpose-designed Excel spreadsheet was used to extract relevant details from each article including SPHS definitions, measures and measurement frameworks, challenges, solutions, and factors that contribute to sustainment and scaling of system change. The Excel spreadsheet was piloted by three reviewers on a subset of five articles and adjusted as needed.

Patient and Public Involvement

No patients involved.

Results

Study Selection

Of 5675 articles identified in the database searches, 2404 were duplicates, leaving 3271 articles. Undertaking independent title and abstract screening of 5% of articles, two reviewers achieved an acceptable level of agreement (Kappa score = 0.6)[19] A further 2750 articles were excluded, leaving 521 articles for full-text review. A substantial level of agreement was achieved on review of 5% of full text articles undertaken independently by four reviewers JHe, YZ, GD and IM; (Kappa = 0.7)[19]. After full text review, 136 were included. Eighty-three additional articles were identified from snowballing, and six of these met the inclusion criteria, for a total of 142 articles included for data extraction (Figure 1). Additional File 1 provides a table detailing the search and a summary of the included articles.

Figure 1. PRISMA flow diagram summarising the review and reasons for article exclusion*

*Full text articles and snowballed articles excluded for the following reasons. Note that some articles were excluded for multiple reasons.

Table 1. Reasons for article exclusion

Reason	Exclusion at abstract screening	Exclusion at full text review
Disaster or emergency	199	3
Foreign aid, equity, or community healthcare	598	20
Occupational health and safety	69	2
Environmental sustainability	89	5
Not relevant to Australia e.g. low-resource setting	730	82
Not about systems e.g., single disease or program	1291	109
Preventative e.g., regarding vaccination or nutrition	277	18
Not relating to healthcare delivery e.g., regarding animal care or food safety	46	0
Regarding physiology/pharmacology	44	0
Does not in another way define, measure, identify challenges, opportunities for improvement or scale up of sustainability in the healthcare system	398	166
Other e.g., article not written in English, full text not available	4	95
Totals	3745	500

Study Characteristics

Of the included articles, 18 were review articles (either systematic or narrative), 82 were editorial or opinion pieces, 37 were primary empirical studies, and five were a combination of a brief narrative review and an empirical study (classified as empirical for simplicity). Empirical studies used a wide variety of data collection techniques and included qualitative analysis of interviews,[20] survey results,[21, 22] analysis of hospital data records,[23, 24] and economic analysis [25-29]. The included articles described studies that covered various geographic

locations, most commonly Canada (n=22), the United States of America (n=22), Australia (n=23, including two which involved Australia and New Zealand), the United Kingdom (n=6), the European Union as a whole rather than individual countries (n=8), the Netherlands (n=2) and one each from Austria, Italy, Northern Ireland, Malaysia, Malta, New Zealand, Nordic countries, Oman, the Philippines, Portugal, Scotland, Spain, and the Western Pacific Region. Forty-two studies discussed healthcare system sustainability on an international scale, one included the United States of America, the United Kingdom, and Australia [30] and another included Australia, Ireland, Austria and Denmark [31].

The data extraction sheet included the citation, study aims, study design, themes addressed, and additional relevant information about SPHS, (Additional File 1). Of the 142 articles, most identified challenges (n=94, 66%) and proposed ways to improve SPHS (n=89, 62%) while fewer discussed measuring SPHS (n=48, 34%), or sustaining and scaling change (n=47, 33%) and fewer still provided any definition of SPHS (n=38, 27%).

Bias and Quality in Included Studies

Forty-three empirical studies scored 25-34 points on the Hawker's Quality Assessment Tool,[16]; 29 of high quality, 13 moderate quality, and one borderline low quality [17]. None of the empirical articles were excluded due to potential bias or low quality (Additional File 2). The quality of editorial and opinion pieces (n = 99) was analysed according to the AACODS criteria, and 72 articles ranked 'yes' for all criteria indicating high quality, (Additional File 2).

Synthesis of Results and Discussion

Defining SPHS

Definitions of SPHS were provided by 25 editorial or opinion pieces, seven review articles, and six empirical studies (Table 2). The definitions fell into three broad groupings: 1) fiscal sustainability, 2) human resource sustainability and acceptance of change by stakeholders, and 3) system adaptability and improvement over time (Table 2). Definitions focused on the importance of continual improvement [30], and acceptance and embeddedness of changes into the fabric of the healthcare system via ongoing approval from stakeholders [32-34]. Generally, definitions were aligned with the authors' aims or concerns, e.g., Rees [30], who tackled sustainability in relation to Lean activities, and Buchan [35] who argued for the importance of human resource development to support SPHS.

Articles defining SPHS in terms of fiscal sustainability [25, 33, 34, 36-39] included, for example, discussions of sustainability of rural primary care services in the face of ongoing policy change on reimbursement and practice incentives [38], adoption of new funding models to ensure availability of needed medicines [25], and adjusting hospital capital investments to improve patient access to care [37]. Articles also discussed the importance of balancing financial interests with social and ecological interests [40].

Several papers conceptualised SPHS as the continuation of programs after the cessation of initial external program-specific funding [41-43]. This aligns with findings from a recent systematic review that specifically focused on the sustainability of health improvement programs[44]. Conceptualising sustainability of programs or interventions as an integral part of SPHS is sensible. However, it is desirable for such definitions to be broadened to include the impacts of sustained programs and interventions at the whole of system level.

Four articles [45-48] discussed SPHS through the lens of a learning health system, a system in which 'science, informatics, incentives, and culture are aligned for continuous improvement and innovation'[49]. These articles focussed predominantly on using data and evidence to support system adaptability and improvement over time.

Table 2. Definitions of SPHS

Definition	**Exemplar Quotes**	**Relevant References**		
		Empirical articles	Editorials or opinion pieces	Reviews
Fiscal sustainability	"The WHO considers fiscal sustainability as a requirement, rather than an objective, of health financing policy. Sustainability of healthcare financing therefore cannot be interpreted as a reduction of healthcare costs, but rather as a predictable growth or control of health expenditures."[25]	[37, 38, 50, 51]	[25, 33, 34, 36, 39, 41, 52]	[42, 43, 50, 53, 54]
Human resource sustainability and acceptability to stakeholders	"It has been increasingly recognised that getting HR policy and management "right" has to be at the core of any sustainable solution to health system performance"[33, 35] "A sustainable health system also has acceptability to key constituents, including patients and health professionals." [34]	[51]	[33-36, 40, 52, 55-60]	[32, 54]
Adaptability and improvement over time to create a future-focused intervention	"A sustainable health system … [has] adaptability, because health and health care needs are not static (i.e., a health system must respond adaptively to new diseases, changing demographics, scientific discoveries, and dynamic technologies in order to remain viable)."[34] "Ensuring that sufficient resources are available over the long term to provide	[38, 46]	[5, 34, 41] [45, 52, 57-67]	[32, 53, 54, 68, 69]

	timely access to quality services that address Canadians' evolving health needs."[61]

Measuring SPHS

The measurement of SPHS was addressed through theoretical discussions across the 24 editorials and seven review articles, and by proposing, developing, or applying measures or indicators (in 17 empirical studies). There are interesting contrasts in the levels at which measurement occurred or was recommended—that is, the boundaries of the 'healthcare system' were variously conceptualised across studies when talking about measures. The complex problem of where to appropriately bound a system has been identified as both interesting and problematic [70]. For example, some studies measure SPHS at a hospital level [71], whereas other studies address it at a national system level [72], making comparisons across studies difficult.

Frameworks and indicators to measure SPHS were heterogeneous (Table 3). The need to measure financial, social and health outputs of health systems were highlighted in recent publications [73]. Some articles criticised the current focus on fiscal metrics of SPHS [36, 74]. Sepehri and Chernomas [36] noted that fiscal metrics assume that providers respond to needs and current medical knowledge, however, this assumption does not always hold. Population health outcomes, such as mortality or burden of chronic disease, were also considered valid indicators of SPHS, but required ongoing timely measurement over the long-term to demonstrate trends and to model future needs [69, 75].

A recent paper [76] suggested that composite metrics combining quality of care, equity of access and health spending may provide a more nuanced measure of SPHS [76]. A variety of new SPHS

measures were proposed, developed, modified, or tested in research environments [21, 23, 48, 68, 71, 77] to address a deficit in currently available measures (Table 3). For example, the Q*Scale was designed to combine data on caseload, patient satisfaction and physician aptitude, such that changes in hospital performance due to policy changes could be more effectively measured [71]. In contrast, the Dynamic Sustainability Framework (DSF) seeks to investigate the fit between the intervention, practice settings, contexts and cultures, health policies, and the broader ecology within which healthcare systems operate, including socio-political systems [41]. Similarly, the Health Care Sustainability Framework (HCSF) and the Responsible Innovations for Health (RIH) framework, recognise the importance of accounting for the needs and trends of the population, workforce, and financial constraints [78, 79].

Models utilising a scoring system (e.g. using the Resilience Indicator) to quantify healthcare resilience were based on data-driven simulation modelling,[80] or theoretical composite indicators of the value of healthcare systems [80, 81]. However, the extent to which such models and indicators are used to support decision making in the real world is currently uncertain.

Table 3. Summary of established and novel frameworks suggested for measuring SPHS

Established framework name	**Rationale for use**
Organisational Change Model (OCM)	To measure the success of sustained organisational change, according to faculty member survey respondents [77]
Analysis of hospital records (e.g., payroll records)	Measuring staff turnover, workforce supply and financial sustainability [23, 27]
Evaluation of health networks	To evaluate the effectiveness and sustainability of health networks [82]
Novel framework name	**Rationale for development**
Q* Scale	To measure performance at the hospital level [71]

Dynamic Sustainability Framework (DSF)	To investigate the fit between the intervention, the practice setting, and the ecological system [41] To improve measurement of SPHS beyond patient outcomes only [42]
Resilience Indicator	To highlight the systemic relevance of primary care network systems to quantify healthcare resilience [80]
eMergy (embodied energy) Sustainability Index	To address the lack of qualitative indicators for sustainability [68]
Future Health Index (FHI)	To identify preparedness of countries to building sustainable health systems [81]
Health Care Sustainability Framework (HCSF)	To measure the relationships between political and fiscal sustainability of an intervention [78]
Responsible Innovations for Health (RIH) Framework	To identify interventions that suitably address five domains (population health, healthcare system, economic, organisational, environmental)[79]
Research Lifecycle Framework	To enhance the impact of the Learning Health System by operationalising research innovations into clinical practice [48]
Value Of Diagnostic Information (VODI) Framework	To outline the multidimensional benefits and potential of healthcare diagnostics [83]

Ultimately, although measurements of sustainability were heterogeneous [42], they could be classified into three broad outcome levels: 1) Individual (e.g., continued health benefits for patients or healthcare providers), 2) Organisational (e.g., continuation of innovations, hospital level fiscal improvements), or 3) Community (e.g., continued use of programs, services or health interventions). The frameworks presented in Table 4 promise more nuanced measures of SPHS. However, these need to undergo robust testing in different systems and contexts to ensure they provide valid, meaningful information to support SPHS.

Identified Challenges to SPHS

Ninety-four articles, including 60 editorials, 22 empirical studies and 12 reviews, identified challenges to SPHS across three main themes: 1) increasingly complex patient populations; 2) ongoing gaps between policy and practice; and 3) concerns of system fragmentation and need for integration for a more streamlined adoption and sustainment of interventions.

Numerous articles identified challenges posed by increasingly complex patient populations [4, 24, 52, 80, 84-90], including complex patients with multiple comorbidities,[22, 51, 80, 85, 86, 88, 91, 92] and greater demand for effective aged care, under already strained healthcare budgets [4, 28, 52, 59, 93-98]. In addition, patients also have higher expectations of receiving healthcare of high quality that meets their needs [5, 22, 85, 86, 88, 99, 100]. Healthcare systems must strive to understand the populations they currently serve and to adapt as populations and their needs change.

A recurring discussion centred on the gap between policy and practice [42, 101, 102]. To bridge this gap, greater investment in the system is sought,[36, 64, 74, 94, 95], including funding novel health interventions [27, 42, 55, 103, 104] and upskilling staff [31, 105]. For example, one article highlighted several challenges in realising the latter, including inadequate stakeholder involvement and organisational leadership unwilling to invest in training programs [31, 46]. To sustain performance, publicly funded health services will need to balance financial, environmental, and social sustainability, whilst withstanding greater public scrutiny [40, 106]. Additionally, governments may need to reconcile higher cost and greater usage of healthcare with flattening health expenditure and reduced spending in other areas [29, 65, 104].

The fragmentation of healthcare systems poses challenges for sustained performance: power imbalances among health personnel and resistance to changes in the scope of practice for some professions limits team approaches to care [107, 108]; siloed care delivery models can become misaligned with the complexity of the healthcare system and complex patient needs [57, 78, 109, 110]. Other publications reported lack of collaboration between public and private hospitals [97, 111]; and widening gaps in care quality in rural/remote regions due to limited resources [24, 38, 97, 112]. Poor linkage of primary care with the broader health system [69] and lack of investment in primary care can also impact health outcomes and health system sustainability [87].

Opportunities for Improvement of SPHS

To address the challenges posed, requires more than a one-time simple "fix". Adaptation to local contexts, and ongoing monitoring and evaluation are required to support the sustainment of effective solutions and to anticipate future needs and solutions [77]. Twelve review articles, 19 empirical articles, and 56 editorials discussed the opportunities for improving SPHS.

Workplace culture in healthcare was identified as an important capacity building factor for sustained system improvement. The importance of physician self-care and well-being was highlighted in numerous studies [47, 101, 113, 114], and was strongly linked with the culture of the organisation, workplace, and system [18]. The importance of mentorship, teaching and leadership were also highlighted as enablers of organisational improvements [20, 46, 100, 101]. Building supportive cultures and expectations of medical graduates is crucial [111, 114-116]. Furthermore, promoting incentives for generalist doctors to practice rurally may close the current geographical gap in access to healthcare [47, 112, 115-117]. The promotion of desired attitudes, values and ideals of healthcare organisations was also recognised for achieving SPHS.

Specifically, valuing and practicing patient-centred care and evidence-based medicine was reported to promote system sustainability [31, 47, 67, 85, 90, 91, 117, 118]. Successful collaboration between and within health facilities, disciplines, and sectors is important for system sustainability [45, 51, 111, 118-121], and collaboration is facilitated by human resource management that values the workforce, use of robust data-driven hospital management systems, and accessible, shared electronic medical record systems [99, 122].

The importance of political stability and bridging the jurisdictional-federal divide in federated healthcare systems (such as in the US, Canada, and Australia) was also emphasised as important for optimal and unified healthcare system functioning [25, 54, 94, 95, 123, 124]. Therefore, it is not only organisational culture in healthcare [125], but the broader organisation, governance and regulation of the healthcare system that are crucially important for SPHS [66, 126, 127]. The impacts of fragmentation in federated systems were recently highlighted by the COVID-19 pandemic. For example, in Australia the aged care system is funded and regulated by the Federal Government, while the states and territories are responsible for hospitals and public health [128]. This contributed to uncoordinated responses to COVID-19 in residential aged care facilities, with consequent outbreaks and lives lost [129].

Community involvement is an important factor that bolsters capacity to implement and sustain change [122]. Empowering patients to care for their own health, and building confidence among caregivers to deliver some aspects of care, reduces burden on the healthcare system [85]. On the other hand, it shifts costs to families and neighbourhoods. Community involvement via Community Based Participatory Research (CBPR) bolsters equity and improves outcomes of care

[130], and responding to recommendations from citizen panels could also improve SPHS [98, 121, 131].

As technology advances, so does the ability to harness it to promote the sustainability of healthcare systems [34]. For example, point-of-care electronic prompts were used in one study of hospital surgical wards to decrease rates of hospital-acquired infections [132] and embedding artificial intelligence and big data analytics hold promise to support efficient and effective service delivery to improve SPHS [57]. Other studies have suggested greater adoption of telemedicine to reduce travel time and costs [5] as complementary support to patients [103], to improve diagnostics [83], and as a platform to promote prevention of illness [24], as contributing to SPHS.

Sustaining and Scaling Change in SPHS

Forty-seven articles addressed this theme, including nine reviews, 11 empirical articles and 27 editorials. Various common factors were found, including the importance of stakeholders' support in sustaining an intervention, strong relationships among organisations within the system, and the ability to flex and adapt in response to changes in contexts.

As interventions are often implemented with limited and/or short-term (2-3 year) evaluation plans, demonstrating SPHS is often elusive [42]. Extended funding periods for improvement and reform strategies are needed and should be coupled with ongoing evaluations using relevant SPHS indicators to support ongoing sustainability, adaptation, and evidence-based investment and resourcing [54]. For example, one article postulated that federal funding agencies should perceive funding implementations of health innovations as ongoing strategic investments rather than time-limited projects [45]. Only one article disagreed with the importance of measuring

sustainability altogether, and argued for a focus on healthcare quality as opposed to conducting formative evaluations [104]. Although the delivery of efficient and effective healthcare should be prioritised, robust evaluations should not be overlooked as a prerequisite and must be embedded alongside implementation, from the outset [133].

Another recurring theme was the importance of accepting changes or adaptations to proposed interventions [134]. For example, Greenhalgh *et al* [135] reported on a three-year case study follow-up of a healthcare system transformation in London and found that the changes were sustained, but in different formats than originally envisaged. This adaptation of interventions to local and changing contexts is a strong characteristic of SPHS that is recognised as one of the hallmarks of implementation science. The increasing adoption of pragmatic implementation trials in healthcare research is an important advance to support effectiveness testing in real-life situations rather than in contrived randomised controlled trials that are difficult to implement at scale in real-world settings to meet the needs of changing populations [48, 136].

A recurring sentiment in the articles reviewed was the importance of support for the intervention from leaders and stakeholders expected to continue implementing change [67, 84, 122, 125, 137, 138]. Leaders and managers have a clear role in supporting staff throughout the processes of reforms and changes, by providing opportunities for co-design, education including e-learning, and building peer networks [64, 139] whilst creating open communication to involve front-line staff in planning and implementation [122, 140]. For example, one article suggested that pharmacists should be involved in developing hospital discharge procedures to improve medication safety and adherence [141]. In more recent articles, policy makers and political

leaders are highlighted as important change agents as long as they work in concert with front-line health staff [54, 138, 142].

Effective relationships among different healthcare delivery organisations were repeatedly identified as important enablers of SPHS. A central funding source coupled with policies and algorithms for equitable distribution of healthcare funds was evident, and particularly prioritised by rural areas [38, 74]. Beyond the government, communities and multi-sectorial partners [52], and collaborations between hospitals, medical schools and physicians were also highlighted as vital for SPHS [73].

Although publications in our review predominantly urged for the sustainability of innovations, recent literature also highlights the need for discontinuation or redesign of programs that have become ineffective or irrelevant over time [5, 41, 135]. This is extremely important to achieve sustainability as it ensures that value is maintained in the healthcare system, especially considering that healthcare systems may be slow to change and tend to maintain status quo [143]. Hence, purposeful work, including embedding ongoing monitoring and evaluation is needed to drive healthcare systems towards more nimble models of operation that are responsive and adaptable and able to anticipate changing needs.

Table 4 summarises the included articles under five headings: those that attempt to define sustainability; those that focus on measuring it; associated challenges of realising sustainable performance; identifying opportunities for improvement; and creating and sustaining sustainability.

Table 4. Grouping of included articles based on the following criteria

Criteria	Explanation	Key points from included articles
Defining sustainability	What do we mean by SPHS?	- SPHS is difficult to define [30, 32-34] - Sustainability is most often framed in terms of fiscal/financial or economic sustainability [5, 25, 33, 34, 36-39, 68] - Sustaining a system intervention post-implementation and initial funding period [41-43]
Measuring	How do we measure SPHS?	- Issue of system boundaries—at which level should we measure sustainability? (e.g., at the individual hospital or healthcare system level)[71, 72] - Heterogeneous outcome data collection techniques (e.g., individual, organisation and community level)[36, 42, 73, 74] - Wide variety of new methods and indicators suggested (see Table 3)[21, 23, 68, 71, 77, 79]
Associated challenges	What challenges are associated with SPHS?	- Complex patient population (e.g., ageing, comorbidities and chronic illnesses)[4, 5, 22, 28, 52, 84-86, 91-97, 99] - The chasm between evidence and practice and policy and practice [27, 29, 36, 42, 55, 64, 65, 74, 94, 95, 101-106] - Fragmentation and gaps (e.g., power imbalances between healthcare personnel, rural versus urban services, fragmentation between public and private hospitals)[38, 77, 78, 97, 107-109, 111]
Opportunities for improvement	What helps improve SPHS?	- Workplace culture (e.g., mentorship, leadership, support for health professionals)[18, 20, 101, 112, 113, 115, 116] - Organisational culture (e.g., promoting collaborative attitudes, transparency, patient-centred care and political stability)[25, 85, 91, 94, 95, 99, 111, 119, 122-124] - Consumer and community involvement to align the system with needs (e.g., patient reported measures, in research, focus groups, and consumer panels)[85, 122, 130, 131] - Implementing technological advances (e.g., e-health)[5, 24, 34, 103, 132]
Sustaining and scaling	What initiatives for have been	- Setting up interventions for sustainability (e.g., extended initial funding periods, ongoing evaluation

	used to improve and maintain to SPHS (or value)?	feedback loops, using pragmatic trial designs)[42, 104, 132, 144] - Support from all stakeholders [52, 64, 84, 122, 137, 139-141] - Developing cross-sectoral, interdisciplinary relationships and collaborations [38, 73, 74, 85] - Ability of intervention to adapt and flex depending on the context of implementation [135]

Conclusion

There is broad agreement that the sustainability of healthcare systems and their performance levels are increasingly being challenged. Our review confirms that the concept of SPHS is important and is frequently discussed in the health and medical literature. Despite discussing healthcare system sustainability, only 38 of 142 documents offered any definition, and the offered definitions were mostly centred on financial or economic indicators. More recent concepts defining SPHS included acceptability of the system to patients, healthcare providers and other stakeholders, adaptation and resilience, and sufficient nimbleness to absorb new evidence and innovations to support continuous improvements.

It is unlikely that we will, nor should we, settle on a single definition of SPHS. We would favour definitions that are robust but flexible to ensure their utility in the many and varied healthcare system contexts, however, authors and editors should strive to ensure that a definition is provided in any discussions of SPHS. We need sophisticated yet practical indicators of SPHS that capture sustainability beyond the traditional economic measures. Such measures have been proposed in the research literature but the utility of such measures for decision-making needs to be tested. The key ways to improve sustained performance include strengthening of workplace cultures, continuous workforce development, direct health consumer and community involvement, and

swift adoption and embedding of new evidence and technologies that are proven to have an advantage over current practice.

List of Abbreviations:

AACODS	Authority Accuracy Coverage Objectivity Date Significance
DFS	Dynamic Sustainability Framework
HCFS	Health Care Sustainability Framework
OCM	Organisational Change Model
PRISMA	Preferred Reporting Items for Systematic review and Meta-Analysis
RIH	Responsible Innovations for Health
SPHS	Sustainable Performance of Healthcare Systems
WHO	World Health Organisation

Additional Files

Additional File 1: SEARCH STRATEGY AND SUMMARY OF INCLUDED PAPERS (Zurynski_HerkesAdditionalFile1.docx)

Additional File 2: QUALITY ASSESSMENT (Zurynski_Herkes_AdditionalFile2.docx)

Additional File 3: PRISMA CHECKLIST (Zurynski_Herkes_AdditionalFile3.docx)

Additional File 4: INCLUSION AND EXCLUSION CRITERIA (Zurynski_Herkes_AdditionalFile4.docx)

Declarations

Ethics approval and consent to participate

Not applicable.

Authors' contributions

JB conceptualised the study and led the team's work. EM, JH, JHo and YZ developed the search strategy. EM, JH, JHo, GD, and YZ conducted the abstract review, and JH, GD, IM and YZ full-text review and data extraction, with JB acting as arbitrator when needed. JH, IM and GD conducted the quality assessment. YZ and JH drafted the manuscript with input from GD and NH, and all authors contributed their comments and approved of the final version of the manuscript.

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Competing interests

There are not competing interests.

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Availability of data and materials

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141. Burgess LH, Cohen MR, Denham CR. A new leadership role for pharmacists: a prescription for change. *J Patient Saf* 2010;6:31-7.
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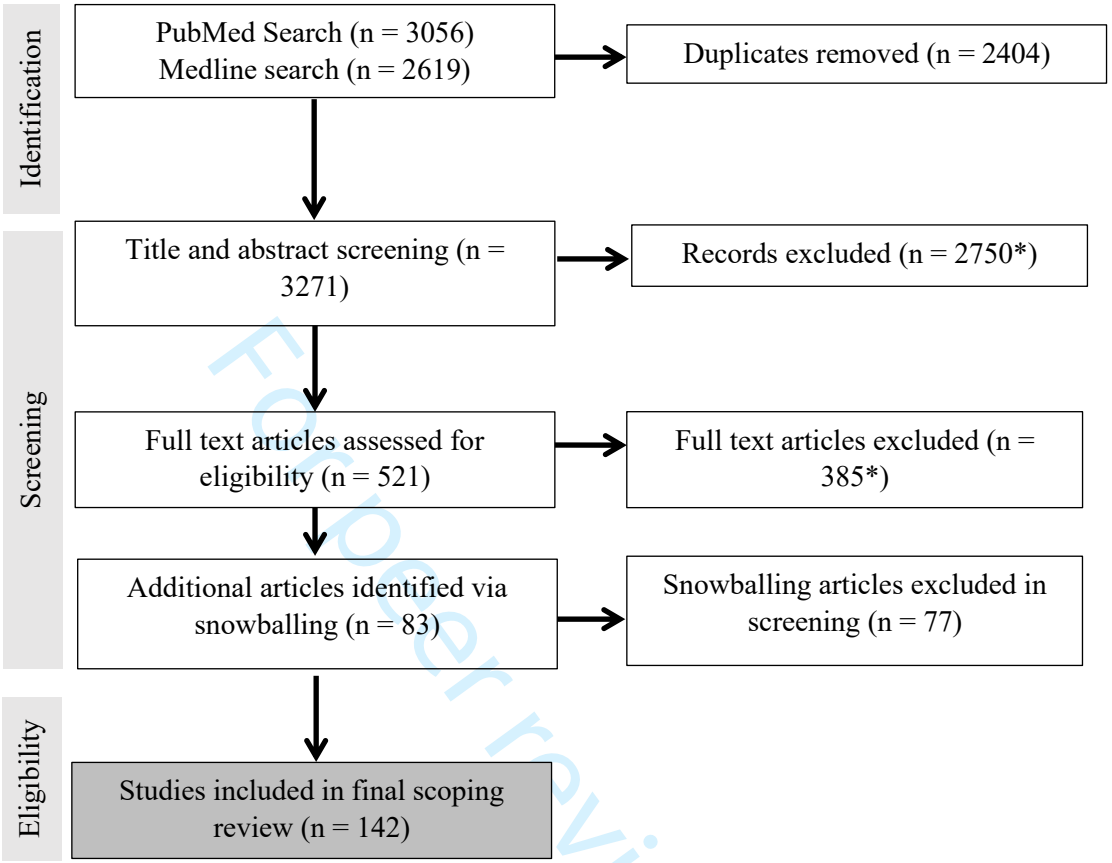
Figure 1. PRISMA flow diagram summarising the review and reasons for article exclusion*



HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

ADDITIONAL FILE 1: SEARCH STRATEGY AND SUMMARY OF INCLUDED PAPERS

Search Strategy

	PubMed	Ovid Medline
	((sustainab*[Title/Abstract]) OR resilien*[Title/Abstract]) AND (((((“health system*”[Title/Abstract]) OR “health system* performance”[Title/Abstract]) OR “health system* improvement”[Title/Abstract])	1. “health system* performance” 2. “health system* improvement” 3. (health adj3 system) 4. 1 OR 2 OR 3 5. (sustainab* OR resilience*) 6. 4 AND 5
Additional Limits	English Language	English Language
Yield	3056 articles	2619 articles

Summary of included studies in scoping review and reasons for inclusion

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of HSPS**	**2. Measuring HSPS**	**3. Challenges to HSPS**	**4. Improvements to HSPS**	**5. Sustaining or scaling change is HSPS**	**6. Other**
Al Dhawi AA, West DJ, Jr., Spinelli RJ, Gompf TA. 2007	2007	Oman	ED			Increased consumer expectations, increased medication costs, and resource constraints	The environment, financial sustainability, institutional sustainability, demand sustainability	The need to examine the entire system: social, economic, and environmental determinants of health in order to sustain changes in the health system	
Amalberti, R., W. Nicklin, and J. Braithwaite. 2016.	2016	Worldwide	ED			Ageing population, patients with comorbidities, and expensive health conditions to treat			
Ament SMC, Gillissen F, Moser A, Maessen JMC,	2014	Netherlands	EM					The importance of internal auditing and feedback of outcomes, (e.g., reminders and meetings),	

Dirksen CD, von Meyenfeldt MF, et al. 2014								changing organisational structure	
Armstrong BK, Gillespie JA, Leeder SR, Rubin GL, Russell LM. 2007	2007	Australia	ED			1. Demography of disease and ageing population; 2. Increasing medical cost; 3. Health workforce supply and distribution; 4. Problems with the quality and safety; 5.Balancing private and public health; 6. Recognition in the importance of investing in the health of the next generation; 7. Urban planning for sustainable communities; 8. Inequity in health	Solutions must include elements of prevention, and primary and acute rehabilitation services		

Atmore C. 2015	2015	New Zealand	ED			Doctors are becoming more specialised, but needs to become more generalist to look after the whole person	Transalpine service model (developed in a rural NZ hospital) provides options for sustainable health care in the future		
Barasa EW, Cloete K, Gilson L. 2017	2017	Worldwide	ED	Resilience is an important quality for creative adaptation		The challenge of thinking of everyday resilience rather than just crises			
Bessler JS, Ellies M. 1995	1995	Australia	ED			Admissions rise, and doctors are using technology more regularly. Public expenditure on healthcare has remained 'flat' but private health care premiums continue to escalate	Need to decrease the amount of beds in the public hospitals (as 15% of inpatients should not be, according to research), increase continuity of patient care (termed 'integrated networks'), and have less of a divide between state and federal health systems		
Birch S, Murphy	2015	Worldwide	ED		Health care sustainability	The unintended consequences of	Sustainability frameworks		

GT, MacKenzie A, Cumming J. 2015					framework (HCSF), showing the relationship between expenditure levels, the determinants of expenditure, revenues to support the health care system, and their relationship to fiscal and political sustainability	redistributing cost of care and responding to the needs of the population e.g., redistributes what socio-economic groups use health care	should take into account the needs and trends of the population, the work force, financial and service information		
Braithwaite, J., D. Marks, and N. Taylor. 2014	2014	Australia	RA	Sustainability defined as the mid-to-long-term acceptance of a program		Looks at the need to improve implementation science, leading to sustainability	Sustainability was one of eight key factors in implementing changes in the health system	Sustainability needs to be considered from the inception of change programs and projects, and there needs to be commitment at a managerial level	
Bramesfeld, A., F. Amaddeo,	2016	European Union	EM		Measure and compare different	Recognises the challenge of			

J. Caldas-de-Almeida, G. Cardoso, A. Depaigne-Loth, R. Derenne, V. Donisi et al. 2016.		Countries			countries using the QMP-MHC scale	bridging policy and practice			
Buchan J. 2004.	2004	Worldwide	ED	Argues that a HR policy is central to any sustainable health system performance changes	Must be sector specific measures e.g., staff per occupied bed, patient acuity measures	The lack of consistent human resource management (HRM), as well as lack of being able to fit HRM to organisational characteristics, context and priorities, and link this to sustainable improvements. No single intervention is likely to be effective in all contexts.		There is low take-up of HRM interventions	

Buchan JM, Naccarella L, Brooks PM. 2011	2011	Australia and New Zealand	ED	The ability for Australia and New Zealand to train enough health staff to fill the positions for their front-line health staff to reduce the reliance on international recruitment	Measurement is limited, e.g., can see if health care staff have received a qualification from a country outside Australia, but not how long they have been working in Australia	Brings into question attitudes of the country towards skilled personnel, immigration, funding of the education sector to train new health personnel (and the time commitment to train new health professionals must also be considered, as must the benefits of overseas personnel for national policy makers)			
Burgess LH, Cohen MR, Denham CR. 2010	2010	Worldwide	ED			Minimizing adverse drug events (ADEs) (and therefore readmissions) by having pharmacist leaders	Pharmacists need to become leaders to change hospital organisational and safety culture, working within an inter-disciplinary team to ensure	Pharmacists should be involved in medication counselling during the discharge process, and follow-up after the transition to	

							medication and medication issues are managed appropriately. Should also establish a medication review board to investigate near misses, being engaged in teamwork and communication, helping implement computerized systems, and being involved in patient training for discharge	home after hospital discharge	
Buttigieg SC, Schuetz M, Bezzina F. 2016	2016	Malta	EM			The need for public and private hospital services to work together to solve complex health care problems and benefit both entities	Collaboration between private and public sectors may involve: 1. a regulated semi-competitive health model, whereby the government sets costs (e.g., for specific tests) and citizens are encouraged to		

							invest in private health insurance; 2. Public-private mix model, which makes care more comprehensive and complete; or 3. Public-private partnerships (PPPs)		
Buykx P, Humphreys JS, Tham R, et al. 2012	2012	Australia	EM	Providing appropriate and cost-effective care in a way that persists in or can adapt to environment. Should also positively influence the broader sustainability of the wider community		In rural health services, sustainability is threatened by small population size and lack of economy of scale, poorly management structures, low socioeconomic groups, and geographic isolation		Rural health services are enabled by supportive policy and state and federal support	
Casale CR, Clancy CM. 2009	2009	United States of America	ED				Improving equity in health through community-based participatory research		

							(CBPR). A component of this research is to plan for long-term process and commitment		
Cashin A. 2015	2015	Australia	ED	A health system must address all aspects of its sustainability, including financial, social and political elements		Being unsure if future conservative governments could threaten universal health care, and encouraging nurse innovation in Australia		Issue of encouraging government support that will be politically costly in the short-term, but beneficial in the long term	
Chambers DA, Glasgow RE, Stange KC. 2013	2013	Worldwide	ED	The continued positive effects of the intervention after the external funding has ended. This is expected to be constantly evaluated, developed and improved	The dynamic sustainability framework (DSF) was created to investigate the fit between the intervention, the practice setting, and the ecological system	Two assumptions of sustaining interventions are challenged: 1. 'voltage drop' where interventions yield lower benefits as they are put into practice outside a laboratory setting; and 2. 'program drift' where programs	Ensure focus on sustainability from the beginning of implementation of the intervention, rather than post-implementation. The setting for the intervention is also important e.g., it should focus on organisational learning,		

						become less effective due to changes in protocol as it is delivered	stakeholders should be involved		
Cho CC, Ramanan RA, Feldman MD. 2011	2011	United States of America	EM		Used analysis of nomination letters for mentor awards to analyse what it is to be a good mentor		Through mentors being role models and legacies for the future		
Coiera E, Hovenga EJ. 2007	2007	Worldwide	ED	Health systems need to be adaptable to changing contexts and strive to be environmentally sustainable	Making it easier to measure sustainability through increasing transparency in work processes	Financial challenges of health care costing more than expected, treating higher volumes of patients with more comorbidities and higher expectations of care, and workforce shortages	Digitisation to cut costs e.g., telemedicine to reduce travel time		
Crisp N. 2017	2017	United Kingdom	ED	Internal factors (1. efficiency & effectiveness of health care provision, 2.		Long term chronic conditions, especially the growing population of		The need of the health and care system to be strengthened by support from communities	

				availability of well trained health staff, 3. cost); external (4. population health, 5. contribution of carers and informal networks of care, 6. integration of policies and practices), and overall (7. public and political acceptability and support)		elderly with needs for community care		and multi-sectorial partners	
De Rosis S, Nuti S. 2018	2018	Italy	EM			Lack of a national or regional office responsible for project coordination. Longer-term financial investment is needed			
Delgado, P. 2016	2016	Canada	ED			Quality improvement			

						collaborative systems did not improve the sustainability of participating health systems in the treatment and management of chronic diseases			
Dhalla I. 2007	2007	Canada	ED		The article speculates that it may be better to assess health care as a proportion of GDP rather than a proportion of Government spending	Politicians are recognising that the 'status quo' may not be sustainable due to system demands. This often assumes tax is static or declining, but this is open to debate and interpretation		Increasing spending on health care can occur as long as it does not impinge upon spending on non-health goods and services	
Dunn, P. M., B. B. Arnetz, J. F. Christensen, and L. Homer. 2007	2007	United States of America	EM				Through a program in which leadership and physicians themselves recognised physician wellbeing as important, and		

							this well-being was measured		
Edwards, N., M. Rowan, P. Marck, and D. Grinspun. 2011	2011	Canada	RA			"Blockages" in the system e.g., power relationships, or unintentional blockages to innovation	Through the use of "leverage point" strategies such as structures by which to organise the system	Identified leverage points and blockages in macro- and micro-levels based on the literature review	
Ehrlich C, Kendall E. 2015	2015	Australia	EM			Participants identified that, should funding cease, the program would not be sustained. This was attributed to limitations in program planning			
Ellner, A. L., S. Stout, E. E. Sullivan, E. P. Griffiths, A. Mountjoy, and R. S. Phillips. 2015	2015	Worldwide	ED			Recognises a lack of traditional metrics to measure health system improvement or sustainability			

Farmanova E, Kirvan C, Verma J, et al. 2016	2016	Canada	EM			Lack of leadership support, difficulty creating partnerships, communicating with and engaging with staff and physicians, struggling with funding models that perpetuate working in silos, insufficient time and resources, difficulty obtaining data, data management and measurement, scoping improvement projects, ensuring sustainability	Start small, but think big; work toward incremental development; select a portfolio of projects that are manageable and align with Triple aim dimensions; include partners at the outset; strategize and build multidisciplinary teams and leverage existing capabilities; do not make assumptions about patients/clients		
Fineberg HV. 2012	2012	United States of America	ED	Affordability (for individuals, organisation			Increased use of IT, re-doubling the efforts to enhance quality		

				s and the government), acceptability to key constituents, and adaptability			and safety in medical care, improving health care of high-need patients in a way that prevents hospitalisations, honour patient preferences, rely on systems engineering and operations research to smooth the patient journey through the health system, learn from peers and from evidence, and champion a system that values accountability		
Foo, C. Y., K. K. Lim, S. Sivasampu, K. B. Dahian, and P. P. Goh. 2015.	2015	Malaysia	EM		Measurement using data envelopment analysis (DEA) overtime to measure efficiency				

Fox, L. A., K. E. Walsh, and E. G. Schainker. 2016	2016	United States of America	EM		Measured group sustainability through staff turnover rate				
Garde S, Hullin CM, Chen R, et al. 2007	2007	Worldwide	RA	Argues that linking the health system sustainability and health information systems is important, but recognises that there is no suitable and all-encompassing definition of sustainability in relation to health care.	There is a lack of qualitative indicators for sustainability. Suggestions of measuring sustainability by the eMergy (embodied energy) sustainability index	There are technological (e.g., making programs that can be flexible and adapt to context changes), socio-political and organizational (e.g., needing drivers behind interventions) issues/barriers			
Global, regional, and national disability-adjusted life-years	2017	Worldwide	EM		Used information previously gathered to make decisions regarding		Formulation of sustainable development goals (SDGs)		

(DALYs) 2017					healthy life expectancy and risk-adjusted life expectancy				
Greenhalgh, T., F. Macfarlane, C. Barton-Sweeney, and F. Woodard. 2012	2012	United Kingdom	ED		Case study: three-year follow-up of a health care program in London that underwent changes in terms of policy and economics		Some services changed over the three years and were altered relating to changes that happened with time e.g. national policy changes	Some interventions were sustained but looked different to the original intervention, due to it being adapted through the three years	
Gruen RL, Elliott JH, Nolan ML, Lawton PD, Parkhill A, McLaren CJ, Lavis JN. 2008	2008	Worldwide	RA	Sustainability after an initial implementation period when funding ceases is difficult				Targets of interventions to improve sustainability included the individual (e.g. through education), organisation (e.g., changes to policy), community (e.g., social actions) and system levels (e.g. social advocacy)	

Guyon A, Hancock T, Kirk M, et al. 2017	2017	Canada	ED				Recognising the importance of governments and the health system providing fund and support for public health, as it delivers important information for the health system to thrive		
Heron, N. 2015	2015	North Ireland	EM				Measure the effect of an intervention for management of musculoskeletal complaints in GP		
Hibbert PD, Thomas MJW, Deakin A, et al. 2018	2018	Australia	EM			When there is an adverse event (AE) resulting in a root cause analysis (RCA), there are barely ever (5% of the time) provided strong recommendations for altering and improving the health system. 86% of	Observations and patient and carer interviews and review of notes may be useful in gaining a better understanding of adverse event situations		

						the recommendations were considered 'weak'			
Hovenga EJ. 2013	2013	Worldwide	ED	Where everyone can access safe and correct health services to achieve the best outcomes possible			Four main outcomes or goals: improved health, responsiveness, financial risk protection, and improved efficiency	Information technology (IT) has a role to play in creating sustainable health systems (as it can lead to decisions having better clinical outcomes and lower costs)	
Inotai A, Petrova G, Vitezic D, Kalo Z. 2014	2014	Central-Eastern European Countries	ED	Focus on financial sustainability	Measure the potential innovation by new drugs in terms of monetary value		Goal of innovative pharmaceutical companies is to provide health gain, equity in health, responsiveness of patients with complex comorbidities. To create this financial sustainability, affordable new innovative		

							treatments and political sustainability are necessary		
Kepros JP, Opreanu RC. 2009	2009	United States of America	ED		Measuring the financial and social output of an organisation		Requires optimal relationships and synergy between the hospital, medical school and physicians, each with their own core competencies		
Kerr R, Hendrie DV. 2018	2018	Australia	EM	Two meanings: 1) financial sustainability for governments and health services; 2) environmental sustainability		To effectively fund patient access to hospital care in a system where capital allocation is not funded based on patient-centredness			
Knutson, D. J. 1997	1997	United States of America	ED		The issue of measurement after the funding period terminate	Limitations in current models of chronic illness management, and the difference between thinking about	Recognises important components of models for critical care: should be patient centred, have a critical illness management		

						and the reality of how clinical work occurs	model, be conscious of minimising patient out-of-pocket expenses, consulting with the organisation, and recognising the link between clinical and research outcomes		
Lega, F., Prenestini, A., Spurgeon, P. 2013	2013	Worldwide	RA		Thirty-seven studies in a systematic review (both qualitive and quantitative were involved, and some had causal relationship analysis)	Rising costs, economic crises and ageing population	Recognise that the performance of health care organisations is correlated to management practices, leadership, engagement with professionals, management characteristics (e.g., training [doctors as managers are beneficial], background, career history), and organisational culture and	Medical engagement is linked to better patient mortality rates, decreased serious incidents, maintains high levels of patient care	

							management status. New technologies are also useful		
Lehoux P, Williams-Jones B, Miller F, Urbach D, Tailliez S. 2008	2008	Worldwide	ED	Recognising the importance of being sustainable overtime, rather than creating for short-term gain					
L, Goeree R, Levine M, et al. 2011	2011	Canada	RA		When post-drug interventions are being used clinically, there should be field evaluation studies conducted to ensure the efficacy and cost effectiveness of the intervention		Coverage with evidence development (CED) is necessary, not to replace RCTs, but to gain the next level of knowledge about that intervention in clinical practice. It will also increase inter-disciplinary collaboration		
Levine, S., S. O'Mahony	2017	United States of America	EM				Interventions to improve palliative care		

, A. Baron, A. Ansari, C. Deamant, J. Frader, I. Leyva, M. Marschke, and M. Preodor. 2017							(PC) in paediatric hospitals, and to improve physician self-care		
Lewis S. 2007	2007	Canada	ED			Financial, ageing population, concern over the proportion of government spending used on healthcare	The challenge of learning from other countries, and recognising the context specific elements of the systems they have enforced, and appropriately contextualising to the Canadian context e.g., Europe pays doctors less than Canada, utilises more home care	Believes sustainability should not be the focus, but rather quality improvement, aligning incentives with goals, making excellence mandatory and reducing health disparities should be the goal for at least the next five years	
Liaropoulos L, Goranitis I. 2015	2015	Worldwide	ED			Ageing population, the financial stress this places on healthcare			It was suggested that taxation should

						systems, and the question of who is to pay for this increased cost? (e.g., does retirement age remain the same or rise?)			be a focus to contribute to health care
Lizarondo, L., C. Turnbull, T. Kroon, K. Grimmer, A. Bell, S. Kumar, M. McEvoy et al. 2016	2016	Australia	EM		Using survey of Scott's 10 strategies for sustaining change in the health system		Allied health respondents recognised that low- or no-impact interventions that cause little improvement or cause harm could be minimised, and by selecting care responses for comparative effectiveness		
Lozano I, Rondan J, Vegas JM, Segovia E. 2016	2016	Spain	ED			Funding and support for ongoing professional learning, recognising differences in health structures between countries to understand how recommendatio			

						ns are transferrable			
Mackenzie J. 2011	2011	United Kingdom	ED	Sustainable development meets the needs of the present whilst ensuring future needs can be met		The challenge of getting the balance between environmental, social and economic sustainability right, and considering how these factors interact	Need to take a systems view of managing system risk, ensuring a more sustainable business system, and being strategic in the long term rather than focusing on short term gains		
Magnan S, Fisher E, Kindig D, et al. 2012	2012	United States of America	ED			There are very few or no direct links between investing health care and establishing the social determinants of health, and there is little communication between stakeholders in these different camps. Rising health care costs are also a concern	The development of "health outcomes trust" organisations and accountable care organisations (ACOs) to work to fulfil the triple aim and have sustainable funding. Community goal-setting could also help to pay for population health		
McGorry PD,	2016	Australia	ED			The challenges of	E-health giving the opportunity		

Hamilton MP. 2016						implementing effective mental health reforms, including allowing access to early intervention with government funding, and funding with the NDIS for more complex cases	for a complementary role at all stages of illness, and the importance of research and evaluation in creating the most cost-effective solutions		
McGrath, S. P., and G. T. Blike. 2015	2015	United Kingdom	EM		Dartmouth-Hitchcock Value Institute Experience		The define-measure-analyse-improve-control framework was developed to allow a problem-solving approach to challenges	The last phase, 'control' promotes the changes to be sustained through time	
McIntosh E, Nagelkerk J, Vonderheid SC, Poole M, Dontje K, Pohl JM. 2003	2003	United States of America	ED			Recognition that nurse managed centres often do not receive the necessary financial support for their centres to be continued	A financial advisory committee (FAC) could help improve financial outcomes in these centres	The FAC had meetings over three years and developed financial skills of the individuals	
McVeigh J,	2016	Worldwide	RA, EM					Participation of people with	

MacLachlan M, Gilmore B, et al. 2016								disabilities (service users) in policy development and the governance of that service to improve sustainability. Additionally, aligning or integrating new models of care with existing models can strengthen program delivery and implementation of policies for rehabilitation. Support from professionals in the field and stakeholders is also beneficial for sustainability	
Molfenter, T., D. Gustafson, C. Kilo, A.	2005	United States of America	EM		Measure the self-reported and faculty-reported the success and	The model used was not able to predict sustainability of interventions or			

Bhattacharya, and J. Olsson. 2005.					sustenance of changes to their organisation	programs, but this may be due to the time period or the sustainability of the measure			
Nagle LM, Pitts BM. 2012	2012	Canada	ED				Recommendations: raise public awareness of services available, improve access to primary health care, empower patients about their care, use incentives to encourage serving in under-served areas, create an integrated health record service, devise alternatives to the fee-for-service model, increase funding for community services, give health professionals communication		

							and language training, emphasise healthy lifestyles, ensure pharmaceuticals are affordable, decrease wait time and increase access for services for mental illness		
Pacifico Silva H, Lehoux P, Miller FA, Denis JL. 2018	2018	Worldwide	ED		Development of the responsible innovations for health (RIH) framework which identifies interventions that respond to the context and support equitable and sustainable health service. It includes 5 domains: 1. population health; 2.	Ensuring Responsible Innovations in Health (RIH), involving consideration of sustainability and equity challenges			

					health system; 3. Economic; 4. organisational; and 5. environmental				
Pencheon D. 2013	2013	England	ED		Measuring preventable illness and unplanned hospital admissions as system failures until proven otherwise	Understanding the changing needs (demographic, social, cultural) of the changing population; understanding how the rapid growth of science and technology can change outcomes; the need for public services to act within environmental boundaries and increased levels of scrutiny	Utilising technology to promote sustainable and personalised health care, and improving the prevention of illness rather than treating the illness once it arises e.g., increasing physical activity		
Peric, N., M. M. Hofmarcher-Holzhack	2017	European Union Countries	RA		Does not answer how we measure sustainability but the				

er, and J. Simon. 2017.					methods or 'actors and actions' by which sustainable health system performance is assessed				
Pronovost, P. J., C. G. Holzmueller, T. Callender, R. Demski, L. Winner, R. Day, J. M. Austin, S. M. Berenholtz, and M. R. Miller. 2016	2016	United States of America	ED		Measuring performance of the Johns Hopkins Hospital (JHH) over a number of years compared to national guidelines		Phase 3 of the program involved a peer education program for health professionals		
Rees, G. H. 2014.	2014	United States of America, United Kingdom, Australia	EM	"Implementation to effect continuous improvement, by either setting a cycle or					

				programming for the next unit on the patient journey to undertake Lean activities"					
Robertson J, Walkom EJ, Henry DA. 2011	2011	Australia	EM		Surveyed both GPs, specialists, and consumers (patients) in the health system, and asked them to identify the potential problems in the system	Both doctors and consumers recognise the rising cost of health care, but doctors are less concerned than consumers regarding the sustainability of the health system			
Robertson TM, Lofgren RP. 2015	2015	United States of America	ED			A large percentage (80%) of health spending is spent on a small proportion (20%) of the population due to complex episodes of care. The challenge is therefore to		"The national health care agenda has been heavily influenced by the assumptions that disease prevention and the general promotion of "population health" will be sufficient to	

						learn to address these in a more cost-effective manner, but this poses difficulties e.g., it is hard to decrease costs through conducting outpatient clinics		reduce health care spending to a sustainable level."	
Rosenberg-Yunger ZR, Daar AS, Singer PA, Martin DK. 2008	2008	Canada	ED	Sustainability of the health system "means ensuring that sufficient resources are available over the long term to provide timely access to quality services that address Canadians' evolving health needs."		The rising cost of pharmaceuticals and biopharmaceuticals, the complicated process by which drugs get approved for funding and use in developed countries, and the time consuming alternatives (e.g., the Special Access Program in Canada). This leads to moral	A mechanism to involve more stakeholders in the discussion		

						questions about the legitimacy and fairness of applying for drugs, especially new and expensive biopharmaceuticals			
Rosser, M. 2006	2006	Canada	ED				The Healthcare Materials Management Services (HMMS) created in 1997 and its success hinged on the collaboration between the hospitals involved	Sustaining change is thought to be attributed to: executive funding, leadership, collaboration, openness of providers to the process, support of front-line clinical leaders, and development of a unique entity with its own culture	
Scheirer MA. 2005	2005	United States of America	RA	Sustaining a program or initiative that had previously been	Sustainability can fall into 3 measures: 1. health benefits continue post-funding	Challenge of funding only for short periods (3-5 years) and the subsequent need to source		The authors suggest that the expectation that a new project will be sustainable after	

				developed and maintained after the initial funding period or other impetus had ended	(individual level outcomes); 2. continuation of program activities post-intervention (organisation level outcomes); 3. relates to changes in community capacity to promote health post-intervention/funding (community level outcomes)	funding. Also challenging is the uniqueness of context, whereby each project is influenced by its context and what programs or activities have preceded it		a 3 year funding project may be overly optimistic (therefore that it is hard to find funding opportunities after that time)	
Schwann, N. M., K. A. Bretz, S. Eid, T. Burger, D. Fry, F. Ackler, P. Evans et al. 2011.	2011	United States of America	EM				Decrease hospital acquired infections through point-of-care electronic prompts (POCEPs)	Sustaining changes from an intervention over a two year period	
Scott IA. 2006	2006	Australia	ED			Baby boomers getting older with	Training patients with counselling and behavioural	Abolishing state and federal boundaries in	

						comorbidities and decreased quality of life, the 'worried well', new technologies, the demand for new and further treatments, the influence of the media (e.g. "miracle cures"), juggling a finite health budget, threats of global warming, and deciding which treatments should be subsidised	strategies to take more control over their own care, encouraging non-traditional caregivers to do some forms of care if found to be equally effective	funding and creating a new federal system, having each patient with a GP responsible for their care, linking healthcare databases with a unique patient identifier	
Sepehri A, Chernomas R. 2004	2004	Canada	ED	Acknowledges that different fields have different definitions of sustainability, and that these definitions tend to focus on resources	Fiscal sustainability has been measured through the percentage of provincial and territorial budget allocation for health care, but this acts on	Threat to sustainability is the uncertainty of government funding			

				and the capacity of the public sector to finance current and future health expenditure	two assumptions. 1) providers are assumed to respond to needs, and 2) the needs are assumed to reflect the current state of medical knowledge				
Shaw J, Wong I, Griffin B, Robertson M, Bhatia RS. 2017	2017	Canada	EM			"Increasingly complex patient population"	Emphasis must be placed on sustainability in order to protect the universal public healthcare system. "Need for comprehensive health system planning"		
Shigayeva A, Coker RJ. 2015	2015	Worldwide	ED	Sustainability is the system's resilience. In a public health perspective, sustainability is defined in relation to if the benefit to	Several frameworks have been suggested, which measure determinants or dimensions of sustainability. They mostly do not		Five programmatic components in disease control programs that are important for sustainability: leadership, capacity, interactions (notions of		

				stakeholders is sustained overtime. Financial sustainability and being responsive to the consumer wishes also important	consider efficiency, which is an important component of sustainability. Underrepresented field: of 108 studies in systematic review, only two looked at HSPS (Lafond 1995a; Pammolli et al.)		integration), flexibility/adaptability and performance		
Solon, O., K. Woo, S. A. Quimbo, R. Shimkhada, J. Florentino, and J. W. Peabody. 2009.	2009	Phillipines	EM		Developed Q* to measure quality of hospital performance across a range of facilities				
Sonnenreich P, Geisler L. 2016	2016	United States of America	ED		Financial issues of rising healthcare costs and	Financial unsustainability in the system, (e.g., that 30% of healthcare	The initiation of a value based formulary in pharmacies		

					decreasing affordability	spending is wasteful) and trying to balance this with allowing patients to access new expensive medicines. But a new way to look at it would be to analyse the *value* of the drug. There is also a problem with patient adherence to medications, especially when they have a higher expense			
Stockdale, S. E., J. Zuchowski, L. V. Rubenstein, N. Sapir, E. M. Yano, L. Altman, J. J. Fickel, S.	2018	United States of America	EM		Through interview analysis	Barriers to sustained improvement included a lack of collaborative working between local practice leaders; another challenge is balancing time that could be	Through the introduction of quality care councils and an evidence based quality-improvement project aimed at improving disciplinary leadership, aligning frontline	Assessed project completion and spread and found it was important to have mechanisms by which to hold frontline innovations would be	

McDougall, T. Dresselhaus, and A. B. Hamilton. 2016						spent on patients to be attributed to the 'extra work' of the project	improvement innovation and assessing implementation designs	suitable for spread (but does not research the impact of this)	
Stoelwinder JU, Paolucci F. 2009	2009	Netherlands	ED			Growth rate of the Australian health system is financially unsustainable, with the Australian Medical Association, as well as state governments, lobbying for more funding. It is also likely that there will be significant resistance by stakeholders when there is suggestion of Australian health system reform	Being inspired by the Netherlands new system of health reform, including policy objectives of durability (sustainability), solidarity (equity), choice, quality and efficiency. Additionally, there are tools to keep citizens engaged in their health care decisions, including the choice of 15 health insurance providers. To avoid insurers seeking out low-risk clients, there has been a		

							complex risk-equalisation scheme put in place		
Stoelwinder JU. 2009	2009	Australia	ED			The need to address both financial and political sustainability in the health system (e.g., with rising health care costs, and the political structures to deal with tax payment rather than consumer payment for the health system)	Governance needs to be established for the "healthy Australia accord", the federal government should progressively take over funding responsibilities for Medicare, and a funding model called "Medicare select" should be established whereby public and private health models compete to allow consumer choice		
Stuart N, Adams J. 2007	2007	Canada	ED		Cost of health care that outpaces economic growth, and a way of conceptualisin	Spending on healthcare is being pushed to unsustainable levels meaning that, in order to be sustained,			

					g this is in a comparison to Maslow's hierarchy of needs, with different levels of health need (but this adds to questions of how health need and benefit are defined)	spending must be taken away from other areas e.g., education, infrastructure; or increase revenue; or decrease cost of health care			
Taylor M. 2007	2007	Australia	ED				The expansion and development of the role of nurse practitioners (NPs) e.g. by improving access to health care in remote and rural Australia		
Thompson RE. 1998	1998	United States of America	ED	Sustainability defined as meeting the needs of the present whilst guarding resources for future generations		Financial and moral factors that influence physician decisions, which have ultimately been influenced by politics and laws		"Managed care" needs to mature and evolve through supporting teaching, research, patient care and care for their staff	

Tricco, A. C., H. M. Ashoor, R. Cardoso, H. MacDonald, E. Cogo, M. Kastner, L. Perrier, A. McKibbon, J. M. Grimshaw, and S. E. Straus. 2016.	2016	Canada	RA		Scoping review to see what knowledge could be gained from studies aiming to use knowledge translation to improve health of patients managing chronic diseases			Specifically examined articles that had follow-up one or more years after the initial test, or continued beyond the funding period	
Tsasis P. 2009	2009	Canada	ED				The potential of improving access to home care for older patients with one or more chronic illnesses, through improving funding for these programs. Additionally, interdisciplinary teamwork and having a patient-centred approach		

							to care has the potential to improve health system sustainability by minimising drug interactions and conflicting advice given to patients		
Van de Pas R, Hill PS, Hammonds R, et al. 2017	2017	Worldwide	ED			The current sustainable development goals (SDGs) are superficial, and more political debate on structure, policy and agency are needed to bridge the gap and overcome existing health injustices. Also noted that many of the SDGs, although not specifically health related, have impacts on health		Stewardship embodying the establishment of norms, values and rules to guide policy development and advocacy for global health across sectors. Also recognised as important is the production of global public goods, the mobilization of global solidarity and the management of externalities e.g., governments, states or	

								transnational bodies	
Veillard J, Denny K. 2014	2014	Canada	ED			The majority of health care spending is on a small proportion of patients	Need for more consistency in practice and delivery methods		
Wakerman J, Humphreys JS. 2011	2011	Australia	RA			Addressing rural and remote areas in Australia. These areas are known for their deficits e.g., high morbidity and mortality, workplace shortages, lack of services and high cost of care delivery. Systems need to realise there is no one-size-fits-all solution, and changes need to align the on the micro-scale health service level as well as the macro-scale	A systematic approach is needed to improve primary health care		

						external policy environment			
Wakerman J, Humphreys JS. 2013	2013	Australia	ED			Tension between national health workforce policy initiatives and demographic, socioeconomic and political forces. Overall, health care service access and the health status is worse in non-metropolitan areas	The aim is to provide accessible, affordable, appropriate health care regardless of geography. Potential improvement in the number of doctors in regional and rural areas if there is a change in the culture of thinking of rural areas as negative, and through the increased number of medical students being trained appropriately for regional and remote work, and addressing the other workforces that collaborate with the rural services (e.g.,		

							funding, infrastructure, governance), and increasing the accountability of the health service through agreed indicators and output measures		
Woodward, G. L., A. Iverson, R. Harvey, and P. G. Blake. 2015	2015	Canada	ED			Recognises the challenge of bridging policy and practice		Requires leadership, transparency, accountability and communication	
Wutzke, S., M. Benton, and R. Verma. 2016	2016	Australia and New Zealand	EM					Four general factors were found to be present in successful interventions: 1. having a sound business case for change; 2. being prepared for the change process and adapting to different contexts; 3.	

								promoting change through stakeholders; 4. ensuring support through the implementation process	
Zhao Y, Russell DJ, Guthridge S, et al. 2017	2017	Australia	EM		Regression analyses of payoll data	Managing fluctuations in funding and the translation of this to staff			
Pisco L, Pinto LF.. 2020	2020	Portugal	ED			Comorbidity and increasing age	Suggests that primary healthcare and preventive care (e.g., maternal health, disease prevention, vaccines etc.) is a strong investment to increase productivity and strengthen social cohesion		
Ganann R, Peacock S, Garnett A, et al. 2019.	2019	Canada	ED			Discusses how an ageing population presses the need for sustainable	Capacity building through health services and policy research training in the following		

						healthcare system.	competencies: understanding health systems and the policy-making process, integrated knowledge transition activities tailored to the specific needs of primary healthcare clinicians and policy making, networking, negotiation an dialogue, project management, interdisciplinary collaborations among patients researchers health practitioners and policy makers, change management implementation, leadership mentorships and collaboration, analysis and evaluation of health related policies and		

							programs, ensuring capacity for meaningful patient engagement, mobilising existing expertise, support careers, building capacity to apply research to real-world problems.		
Jessup RL, O'Connor DA, Putrik P, et al. 2019.	2018	Global	ED			Increasing pressures from ageing population, increasingly prevalent chronic disease, higher cost of tests, workforce shortages.			
Vainieri M, Noto G, Ferre F, Rosella LC. 2020.	2020	Global	ED	Defines sustainability as the ability of a health system to meet the needs of present and future.	broadly discusses how performance monitoring or measurement isn't currently sensitive enough to monitor	Overall short-term bias and perspective of the health system impacts establishing health system sustainability	Challenges listed include the need for improvement in data collection management, the need to adopt a patient-based perspective, and how performance measures are used in practice.		

					health system sustainability				
Lo Sardo DR, Thurner S, Sorger J, Duftschmid G, Endel G, Klimek P. 2019.	2019	Austria	EM		Measures resilience, however, the paper argues that to be sustainable health systems must be resilient	Rising costs, chronic conditions, and ageing	To counter unsustainability health systems must be resilient		
Williams I, Allen K, Plahe G.2019.	2019	England	EM		Rationing of finances and how this occurs in reality, with reference to the 'seven forms of rationing' (and how this can be applied to see if health systems are sustainable) - e.g., dilution via spreading thin of resources	Recognition that there are perceived barriers to timely release of central funding, and the need to prioritise spending			
Ammentorp J, Bigi	2021	Australia, Ireland,	EM			Challenges to implementing	Communication training programs		

S, Silverman J, et al. 2021.		Austria, Denmark				programs: convincing investors, involving stakeholders, locating change agents	→ improving competencies and knowledge related to patient centred care		
Braithwaite J, Mannion R, Matsuyama Y, et al. 2018.	2018	Global	ED			Common pressures or stressors are manifesting in every healthcare system; these include scarcity of financial and staff resources, expectations of the public, and maintaining healthy relationships with multiple stakeholders			
Buttigieg SC. 2019.	2019	Global	ED	Sustainability in healthcare defined as "key task for health policy-makers to withstand social,		Challenges discussed include service delivery, human resources, leadership and governance	"Among these include an open innovation strategy that redesigns sharing intellectual property, resources, and data – and therefore		

				financial, and ecological pressures and challenges"			introducing flexibility, easier accessibility to libraries and collections of molecular entities, as well as opportunities for external researchers to work alongside company scientists."		
Byskov J, Maluka S, Marchal B, et al. 2019.	2019	Global	RA					"The debate on defining and operationalizing more sustainable systems approaches by more strongly including a priority setting and a decision-making process guidance raises the question whether (1) technical evidence-based information is most important and can be improved by	

								more participatory value and specific context-based approaches (Baltussen et al., 2013) or (2) the participatory democratically based approaches (Biehl and Petryna, 2013; Daniels et al., 2015) are most important, but need support from technical evidence.”	
O'Brien N, Li R, Isaranuwatchai W, et al. 2019	2019	Global	ED			Paper looking at HTA as a means of improving HSS. Cites confusion over definition of HTA as a barrier to its implementation	"Health technology assessment (HTA) is a multi-disciplinary exercise for assessing the clinical and cost-effectiveness of technologies in the form mainly of programs of health (and		

							sometimes social) care, together with their associated structural, procedural and implementation arrangements".. Governments consequently need to take responsibility for the development of strong and sustainable health systems		
Hanney S, Kanya L, Pokhrel S, Jones T, Boaz A. 2020.	2020	Global	RA			Research funding is a major barrier to HS research and therefore health systems cannot be improved. Discusses waste in research and fragmentation	" WHO Health Evidence Network Synthesis Reports. What is the evidence on policies, interventions and tools for establishing and/or strengthening national health research systems and their effectiveness? Copenhagen:		

							WHO Regional Office for Europe"		
Bentley C, Peacock S, Abelson J, et al. 2019.	2019	Canada	EM			Expensive cancer treatment.	The paper calls to use cost effective decisions and involve patients when making cancer funding decisions. Also, to disinvestment if that treatment becomes less effective later		
Braithwaite J, Vincent C, Nicklin W, Amalberti R. 2019.	2019	Global	ED				We will need to reflect a reasons health journey overall in evaluations and treatment		
Braithwaite J, Zurynski Y, Ludlow K, Holt J, Augustsson H, Campbell M.. 2019.	2019	Global	EM protocol	Defines fiscal sustainability, equality					
Rudnicka E,	2020	Global	ED				An ageing population	establishing a platform of	

Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. 2020.								innovation and change, support country planning and action, collect better global data on health ageing, promoting research that addresses the current and future needs of older people, aligning health systems to the needs of older people, laying the foundations for a long-term care system in every country, Ensuring the human resources necessary for integrated care, undertaking a global campaign to combat ageism, defining an economic case for investment, Enhancing the	

								global network for age-friendly cities and communities.	
Shen H, Sui Y, Fu Y. 2020.	2020	Global	EM		This paper looks at apply social choice theory and the Stochastic Multicriteria Acceptability Analysis for group decision making (SMAA-2) to measure the value of health systems. The measurement consistent of three metrics; access, satisfaction, and efficiency, and considers individual preference to each. The article				

					suggested that measuring value is the ultimate goal of modern healthcare and can assist in building sustainable health systems				
Fridell M, Edwin S, von Schreeb J, Saulnier DD. 2020.	2020	Global	RA				Implies that resilience is essential to a sustainable healthcare system. Common factors contributing to resilience included: financing, highly skilled		

							workforce, continuous collection of information at the population level, leadership and governance, medical products (such as vaccines and affordable medications), and service delivery.		
Walsh K. 2019.	2019	Global	ED			Limited budget: "Health systems strengthening is a challenge – how can we improve access, coverage, quality and efficiency, and still keep within a limited budget?"	Developing human resource potential through e-learning	Broadening e-learning through online simulations, build on access (e.g., expand to mobile devices and apps)	
De Santis M. 2019.	2019	Global	RA			Change is expensive and incremental, integrated care is hard to quantify	Suggests that integrated care is a solution to system fragmentation, efficiency, and high costs in chronic disease and rare diseases	To achieve and scale integrated care there must be: political support and commitment, strong governance, stakeholder	

								engagement, organisational change, leadership, workforce education and training, patient focus/empowerment, financing incentives, ICT infrastructure and solutions, monitoring/evaluation system	
Ferrelli RM, Fantini B, Taruscio D. 2019.	2019	European Union	ED			Affordability and financing of equal access and healthcare delivery for people with rare diseases	Discusses networking or rare diseases providers to improve knowledge and healthcare delivery in the EU. The paper also suggests that resilience is important to sustainability	Discusses levers about to build a sustainable health system for rare diseases. Levers include: organisation structure, partnerships, workforce, knowledge development, leadership and governance, and country specific context.	
Steenhuis S, Struijs J,	2020	Global	RA			Discusses challenges in implementing	"Our study shows that bundled payment		

Koolman X, Ket J, E VDH. 2020.						and changing payment methods to address health system sustainability	contracts affect a broad range of health system actors, so their design and implementation should not be approached as merely the introduction of a new contracting model, but as part of a broader transformation to a more sustainable, value-based health care system. This approach should not focus on the volume and price of separate health care products but on the full care cycle of patients and the integral costs and outcomes associated with it"		
Nikolić B. 2020.	2020	Europea n Union	ED			Discusses the fiscal	This paper focuses on	This paper discusses how	

						sustainability of health systems, how spending has outpaced GDP and uses Baumols theory and the human factor in healthcare (that much of it cannot be automated) causing costs to rise.	market competition and competition law between providers and how this could improve costs	healthcare providers can be considered undertakings through international case law and through guidelines e.g., separation of each activity performed, separation of management activities and calculate the economic nature of each of service item.	
Niraula S. 2019	2019	Canada	ED			Discusses how cancer medication funding is at odds, and needs to be balanced against, the fiscal sustainability of the healthcare system in Canada. A challenge in this sector is that	To address the high cost, and maintain fiscal sustainability the authors suggest to: improve collaborations and decrease duplication of efforts in R&D, minimise the conflicts of interest among members, involve		

						cancer drugs are expensive	citizens into decision making process, reconsider the funding model to an outcomes based funding model, incentivise cheaper alternatives (generic drugs) and penalise branded ones.		
Pereno A, Eriksson D. 2020.	2020	Nordic Countries	EM and RA	"In spite of the different ways to define sustainable healthcare systems, and regardless of whether the three-pillar model or the integrated understanding of sustainability is applied, all		In the introduction the paper mentions rising costs, chronic disease, societal pressure such as informed and sometimes demanding patients			

				approaches seem to have in common that a comprehensive approach with a long-term focus and a need to balance economic, social, and ecological interests needs to be used in the discussion of sustainable healthcare systems."					
Bogaert P, van Oers H, Van Oyen H. 2018.	2018	European Union	EM and RA		By developing a sustainable health information infrastructure for monitoring performance		A unified information system with clear governance, central coordination and distributed implementation across EU countries will	Vague - it talks mainly about the structure of the information systems	

							support system performance - provide unified data		
Wurcel V, Cicchetti A, Garrison L, et al. 2019.	2019	Global	ED			financial implications of value of diagnostic information (VODI), including supporting cost containment, allowing timely interventions and preventing disease progression and long term cost. This requires rapid technological pathology testing and turn around times to allow rapid clinical decisions (e.g., point-of-care testing, e-health records)	the need to identify and leverage the benefits of the value of diagnostic information for health systems		

Cunningham FC, Ranmuthugala G, Westbrook JI, Braithwaite J. 2019	2019	Australia	ED		Via the framework/network.				
Embi PJ, Richesson R, Tenenbaum J, et al. 2019	2019	USA	ED	Learning health system			the research results should extend far beyond the awardees who conduct the research, and there should be collaboration between funding agencies	that federal funding agencies should see investment in an initiative as an ongoing strategic investment rather than a time-limited option	
Enticott J, Braaf S, Johnson A, Jones A, Teede HJ. 2020.	2020	Australia	EM	Links to a learning health system relying on continuously learning		challenge of engaging multiple stakeholders in governance, research and within the health system itself; having leadership with focus, vision and engagement; skilled	creating a vibrant learning culture with top down and bottom up support; clinician engagement and inclusion; transparency around patient data use and research	importance of consistent investment/funding overtime	

						workforce and capacity building; data access and sharing/collaborating with consent			
Park YL, Canaway R. 2019.	2019	WHO Western Pacific Region	ED	"Healthcare system sustainability and resilience relate to preparedness and capacity to cope in the face of disease outbreak or disaster."			Move towards universal healthcare which will enable "quality; efficiency; equity; accountability; and sustainability and resilience"	Well-established care Utilising traditional medicine	
Quaglio G, Figueras J, Mantoan D, et al. 2018.	2018	Italy/ Belgium	ED			Y "Over the last 2 decades, health systems in the European Union (EU) are being questioned over their effectiveness and	Y - "(i) community participation is a key principle of health promotion practices, stemming from an ideological position that shifts from a		

						sustainability. In pursuing both goals, they have to conciliate coexisting, not always aligned, realities. For example, (i) an epidemiological transition where chronic conditions and complex patients require integrated services pivoting around primary care, that contrasts with the prevalence of specialized, rather fragmented care, mainly provided by hospitals;1,2 (ii) a pervasive idea that more care is always	bio-medical paradigm towards a social model that creates conditions where people are active participants in their own healthcare;16 (ii) strengthening primary care is one of the major challenges facing EU healthcare systems as they reduce fragmentation in care provision. Decision makers are searching for models that are able to increase the whole pathway of care: primary, secondary and tertiary, long-term care and eventually social care;17 (iii)		

						better than less care, when there is a widespread evidence of inappropriate use of treatments and technologies;3 (iii) the rising promise of personalized medicine, that eclipses the efforts in promoting healthy lifestyles;4 or (iv) the increasing demand of information and transparency with respect to services' quality and safety, that contrasts with serious flaws in the good governance of health services.5	threats to good governance—lack of appropriate competences, the existence of conflicts of interest, bureaucratic rigidity—translate into a lack of transparency, poorly thought-out policies and the prevailing use of the 'low-hanging fruit' strategy;18 and (iv) finally, the generation and reuse of health data (administrative, clinical, environmental, etc.) are essential in embracing the change in the knowledge paradigm towards learning health systems		

						Underlying these challenges is a profound transition in the medical knowledge paradigm, from the traditional and prevailing heuristic approach to the development of data-driven learning systems."	and subsequently toward more sustainable health systems"		
Kilbourne AM, Braganza MZ, Bowersox NW, et al. 2019.	2019	USA	EM			Funding, lack of incentives for researchers to apply their research into practice		Discusses how the learning health system may contribute to incremental change and enhancement of health system performance.	
Lehoux P, Roncarolo F, Silva HP, Boivin A, Denis JL,	2019	Global	RA			"Since the late 1980s, new health technologies not only	Successful health systems are characterized by healthy people, superior care and fairness. The		

Hebert R. 2019.						increased global inequalities, but they also undermined the sustainability of health systems in rich and poor countries alike. "	researchers write that “over the next decades it will be imperative to implement policy mechanisms that can support the development, financing and use of innovations that do not compromise but rather contribute to the success and sustainability of health systems.”		
Editorial. Healthcare quarterly (Toronto, Ont.). 2020;22(4)	2020	Canada	ED	Health systems need the right distribution of educated health professionals who have the right training and mindset; the skills and support to build	Yes	Yes	Yes	Yes	

				effective teams and visionary leaders who co-create compassionate cultures and inclusive partnerships that foster integrated patient-centred care; and the right resources, processes, and tools to deliver solutions for current and future demands.					
Measuring universal health coverage based on an index of	2020	Global	EM		Measures of UHC; UHC viewed as way of achieving health system sustainability and	Talks about challenges in achieving UHC-especially for low income countries - identifies per-capita spending			

effective coverage of health services in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet (London,					sustainable health outcomes.	to be able to reach 90% UHC as $2538…Also identifies USA as outlier - achieves only 82% overall coverage despite spending ~8500 per capita			
Abimbola S, Baatiema L, Bigdeli M.. 2019.	2019	Global	RA	Talks about resilient structures and Financing models		Talks about the challenges of decentralisation - i.e.. Decentralised governance and financing to jurisdictions and the impacts of this model. Australian specific			

Barbazza E, Kringos D, Kruse I, Klazinga NS, Tello JE. 2019.	2019	Global	EM & RA	Provides a definition of a sustainable primary care system that is linked with the broader health system	Provides a framework "The resulting framework applies a performance continuum in the classical approach of structures-processes-outcomes spanning 6 domains – primary care structures, model of primary care, care contact, primary care outputs, health system outcomes, and health outcomes – that are further classified by 26 subdomains and 63 features of	Lack of standardised data collection; poor linkage of primary care with broader system			

					primary care."				
Craig N, Robinson M. 2019.	2019	Scotland	ED	Yes		Yes		Yes	
Costa-Font J, Levaggi R. 2020.	2020	Global	ED	This perspective paper argues that a sustainable health system design encompasses identifying opportunities and incentives for innovation, alongside an analysis of its effect on expenditure. Although aging alone is not a powerful cost driver, the	Mainly in terms of economic outcomes	Focuses on ageing and increasing demands for new medical technologies including new treatments but talks about the potential impact of prevention	Prevention	Yes	

				combined effect of costly innovation, personalized care, and the rise of chronic conditions is. We identify an increasing role of prevention, the reduction of the prevalence of chronic conditions, re-organisation of incentives in health care markets, including a closer scrutiny of the appropriateness of new treatments					

Derakhshani N, Doshmangir L, Ahmadi A, Fakhri A, Sadeghi-Bazargani H, Gordeev VS. 2020.	2020	Global	RA	UHC is implied to be a sustainable health system	Focussed on UHC as a goal for sustainability; uses a framework and several dimensions… Talks about determinants, barriers and enablers of sustainable UHC	Service delivery (dimension 5) is another dimension of the suggested tool with four axes: basic benefits package, geographical access, quality of care, and human resources for health. In regards to the benefits package axes, developing an affordable, sustainable, and equitable basic package of health care services that can serve various population needs is a challenge.	Yes - talks about culture, integration, seamless care. Diffusion of Excellence practices in making a difference every day for veterans, this article highlights 4 different practice areas: 1) direct scheduling, 2) access to health care in rural areas, 3)	Yes - Social infrastructure and social sustainability (dimensions 1–2) seem to be influential factors in progress towards UHC: society literacy, community income, poverty, age group, and population.54 To reach social sustainability and providing social infrastructure, as well as providing sustainable development, political will and determination, technical skills, expertise, and administrative cooperation are required.	

								Political commitment can be a pivotal issue in progress to achieve UHC. Socio-political and economic sustainability essential to support a sustainable UHC	
Clancy C. 2019.	2019	USA	ED	Not as such… indirect	talks about data to support innovation and measure success		Yes - talks about culture, integration, seamless care. Diffusion of Excellence practices in making a difference every day for veterans, this article highlights 4 different practice areas: 1) direct scheduling, 2) access to health care in rural areas, 3) access to mental health care, and 4) interactive and	large national network providing care to 9 million veterans; Importance of systems and data. The next challenge, however, is elevating such lessons learned to transition the initiative from a nascent start-up to a sustainable part of VHA's culture. There are 3 primary components of the current	

							patient-centred care.	transition plan: 1) cultivate the culture, 2) build partnerships and encourage collaboration, and 3) embrace appropriate technology.	
Marcotte LM, Moriates C, Wolfson DB, Frankel RM. 2020.	2020	USA	ED	indirectly describes sustainability through high value care, professionalism and education and appropriate incentives and remuneration; It talks about re-conceptualising high value in terms of "infusing" this concept as a principle for			Yes - supporting professionalism is seen a more durable intervention rather than dealing with incentives for single aspects of practice. Linking professionalism with payment reform	"Medical professionalism is a strong, durable, intrinsic motivator for improving value in healthcare delivery and should be employed to support training efforts, systems change and payment reform".	

				practice among all doctors in training... Providing high-value care as a competency for doctors in training					
Witter S, Palmer N, Balabanova D, et al. 2019.	2019	Global	RA	The term "HSS" first came from a recognition of the need to address the distorting effects of increasing expenditure on vertical programmes targeted to address specific diseases and interventions (e.g., HIV/AIDS, polio) in the absence of support to					

				broader systems, while recognising that without strengthening of basic health systems, vertical programmes would be unlikely to deliver as expected.					
Sturmberg JP. 2018	2018		ED				Could work to improve the resilience of patients with multi-morbidities. This has been shown to help prevent overutilization on the health system, as well as improve the QOL of patients		
Thistlethwaite JE, Dunston R,	2019	Australia	ED		Recognise that interprofessional health education		The importance and shift of interprofessional education from an organisational		

Yassine T. 2019.					needs to be funded constantly (even if funding is relatively small) and that it needs to be able to be adapted to micro, meso and macro processes		to a national level, and the role of national funding		
Iskrov G, Stefanov R, Ferrelli RM. 2019.	2019	European Union	ED		Recognition that fiscal sustainability is important, and that achieving this means that more prevalent diseases get more funding	The challenge of making primary care accessible, affordable, and reducing unnecessary hospital admissions. Integrating the health workforce to the benefit of the patient. Anticipating for changes in need and changing the health workforce accordingly.			

						And that constant data collection and analysis could improve policy and practice			

*Note.
ED – editorial, opinion piece; RA – review article, EM – empirical article.

HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

ADDITIONAL FILE 2: QUALITY ASSESSMENT

Hawker rating for included empirical articles

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalizability	Implications and usefulness	Total (out of 36)
Ament SMC, Gillissen F, Moser A, Maessen JMC, Dirksen CD, von Meyenfeldt MF, et al. 2014	4	4	4	3	4	4	4	3	3	33
Bramesfeld, A., F. Amaddeo, J. Caldas-de-Almeida, G. Cardoso, A. Depaigne-Loth, R. Derenne, V. Donisi et al. 2016	4	4	3	3	4	1	4	3	4	30
Buttigieg SC, Schuetz M, Bezzina F. 2016	3	3	4	3	3	4	4	3	4	31

Buykx P, Humphreys JS, Tham R, et al. 2012	4	4	2	1	1	3	4	2	4	25
Cho CC, Ramanan RA, Feldman MD. 2011	4	3	4	4	4	1	4	3	4	31
De Rosis S, Nuti S. 2018	3	4	4	3	4	1	4	3	3	29
Dunn, P. M., B. B. Arnetz, J. F. Christensen, and L. Homer. 2007	3	4	4	4	4	1	4	3	3	30
Ehrlich C, Kendall E. 2015	4	3	4	3	3	3	4	3	3	30
Farmanova E, Kirvan C, Verma J, et al. 2016	4	3	3	2	3	1	4	2	4	26
Foo, C. Y., K. K. Lim, S. Sivasampu, K. B. Dahian, and P. P. Goh. 2015	4	4	3	2	4	2	4	3	3	29
Fox, L. A., K. E. Walsh, and E. G. Schainker. 2016	4	4	4	1	4	1	4	2	3	27
Garde S, Hullin CM, Chen R, et	3	4	3	4	4	1	3	2	3	27

al. 2007;129(Pt 2):1179-1183.										
Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. 2016	4	4	4	3	4	3	4	4	4	34
Heron, N. 2015.	3	3	4	4	4	1	4	4	2	29
Hibbert PD, Thomas MJW, Deakin A, et al. 2018	4	4	3	3	4	3	4	3	4	32
Kerr R, Hendrie DV. 2018	4	4	4	3	4	3	4	3	4	33
Levine, S., S. O'Mahony, A. Baron, A. Ansari, C. Deamant, J. Frader, I.	4	3	4	3	4	1	4	3	4	30

Leyva, M. Marschke, and M. Preodor. 2017										
Lizarondo, L., C. Turnbull, T. Kroon, K. Grimmer, A. Bell, S. Kumar, M. McEvoy et al. 2016	4	4	4	3	4	3	3	3	4	32
McVeigh J, MacLachlan M, Gilmore B, et al. 2016;12(1):49.	4	3	3	3	4	4	4	3	3	31
McGrath, S. P., and G. T. Blike. 2015	4	4	4	3	3	1	4	1	2	26
Molfenter, T., D. Gustafson, C. Kilo, A. Bhattacharya, and J. Olsson. 2005	2	2	4	2	4	3	3	3	4	27
Rees, G. H. 2014	3	4	3	3	4	1	4	3	4	29
Robertson J, Walkom EJ, Henry DA. 2011	4	4	4	3	4	4	4	3	3	33
Scheirer MA. Is sustainability	3	2	3	3	4	4	2	2	4	27

possible? A review and commentary on empirical studies of program sustainability. Am J Eval. 2005;26(3):320–47.										
Schwann, N. M., K. A. Bretz, S. Eid, T. Burger, D. Fry, F. Ackler, P. Evans et al. 2011	4	2	4	2	4	3	3	2	3	27
Shaw J, Wong I, Griffin B, Robertson M, Bhatia RS. 2017	3	4	4	2	4	1	4	3	3	28
Solon, O., K. Woo, S. A. Quimbo, R. Shimkhada, J. Florentino, and J. W. Peabody. 2009	4	4	4	3	4	3	4	3	4	33
Stockdale, S. E., J. Zuchowski, L. V. Rubenstein, N. Sapir, E. M.	4	4	4	3	4	1	4	3	4	31

Yano, L. Altman, J. J. Fickel, S. McDougall, T. Dresselhaus, and A. B. Hamilton. 2016										
Wutzke, S., M. Benton, and R. Verma. 2016	4	4	4	3	4	4	4	3	3	33
Zhao Y, Russell DJ, Guthridge S, et al. 2017	4	4	4	3	4	3	4	3	4	33
Lo Sardo DR, Thurner S, Sorger J, Duftschmid G, Endel G, Klimek P. 2019.	3	3	2	1	4	1	4	3	3	24
Williams I, Allen K, Plahe G. 2019.	3	4	4	4	4	4	4	4	4	35
Ammentorp J, Bigi S, Silverman J, et al. 2021.	4	4	3	3	4	3	4	4	4	33
Bentley C, Peacock S, Abelson J, et al. 2019.	4	4	3	3	3	3	4	4	4	32
Shen H, Sui Y, Fu Y. 2020.	4	4	2	2	4	4	4	4	4	32

Fridell M, Edwin S, von Schreeb J, Saulnier DD. 2020.	4	4	3	3	4	4	4	4	4	34
Pereno A, Eriksson D. 2020.	3	4	3	3	4	3	4	4	4	32
Bogaert P, van Oers H, Van Oyen H. 2018.	4	4	4	3	3	3	4	4	4	33
Enticott J, Braaf S, Johnson A, Jones A, Teede HJ. 2020.	4	4	4	3	4	4	4	3	4	34
Kilbourne AM, Braganza MZ, Bowersox NW, et al. 2019.	4	3	3	3	4	2	3	4	4	30
Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease	4	4	4	4	4	3	4	4	4	35

Study 2019. Lancet. 2020.										
Barbazza E, Kringos D, Kruse I, Klazinga NS, Tello JE. 2019.	4	4	4	4	4	3	4	3	3	33

Note.
Each category is rated on a 4-point scale (from 1="very poor" to 4="good") to create a total score of up to 36.

AACODS rating for editorial and opinion articles

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Al Dhawi AA, West DJ, Jr., Spinelli RJ, Gompf TA. The challenge of sustaining health care in Oman. *Health Care Manager*. 2007;26(1): 19-30.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, peer reviewed	Yes	Focus on Oman	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article in recognising threats to the health system in Oman, and a model for sustaining health care reform in Oman is discussed
Amalberti, R., W. Nicklin, and J. Braithwaite. 2016. Preparing national health systems to cope with	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not explicit, but article to report on an international workshop previously conducted. No	Yes	Wide coverage, worldwide discussion encapsulating main issues associated with an ageing population	Yes	Recognise this paper made in association with the International Society of Quality in Health Care (ISQua)	Yes	Clear date acknowledgement as from 1960-currently (2016 when article was published). Key	Yes	Good summary of current worldwide problem, and nuance between cohorts of countries experienci

the impending tsunami of ageing and its associated complexities: Towards more sustainable health care. Int J Qual Health Care 28 (3):412-414. doi:10.1093/intqhc/mzw021.				method reported. Published in peer-reviewed journal				and participants from the countries involved. However, offers a balanced opinion of the issues discussed		references also included		ng an ageing population to different extents
Armstrong BK, Gillespie JA, Leeder SR, Rubin GL, Russell LM. Challenges in health and health care for Australia. *Medical*	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clearly stated in presenting the challenges to make a sustainable health care system	Yes	Focus on Australian health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Unique and useful article outlining some main challenges of health care, tailored to the health system and context in question

Journal of Australia. 2007;187(9):485-489.												
Atmore C. The role of medical generalism in the New Zealand health system into the future. New Zealand Medical Journal. 2015;128(1419):50-55.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	New Zealand health care specific, but recognises that the solution could be applied to other health systems	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Emphasises the importance of being a generalist and how this could trailblaze this new role and system design for other countries
Barasa EW, Cloete K, Gilson L. From bouncing back, to nurturing emergence: reframing the concept of resilience in health systems	Yes	Authors have authority and are from various continents around the globe, relevant references included. Published in peer-	Yes	Brief described and met. No methodology provided	Yes	Worldwide coverage that aligns with the authors diverse backgrounds	Yes	Well balanced presentation incorporating worldwide need to nurture everyday resilience in health care, rather than	Yes	Framed around the Ebola outbreak (2014-2016). Contemporary references also used	Yes	Relevant worldwide to all health systems

strengthening. *Health policy and planning.* 2017;32(suppl_3):iii91-iii94.		reviewed journal						just in emergencies				
Bessler JS, Ellies M. Values and value--a vision for the Australian health care system. *Australian Health Review.* 1995;18(3):6-17; discussion 18-29.	Partially	Authors have authority in IT but not healthcare, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided, peer-reviewed	Yes	Focus on Australian health system	Yes	Author bias not explicitly stated, but standpoint is clear	Yes	Context of article identified as current (at time of publication). Key contemporary references included	Yes	Investigates the need for health reform to address rising costs with the health system and increase itd sustainability
Birch S, Murphy GT, MacKenzie A, Cumming J. In place of fear: aligning health care	Yes	Authors have authority in a combination of fields (health economics, policy	Yes	Clear brief in outlining the current healthcare expenditure, and creating the healthcare	Yes	Worldwide, with examples from Australia, the UK and Canada	Yes	Authors standpoint clear. Examples from numerous countries and from reviews in the field,	Yes	Context of article identifiable. Key contemporary references included	Yes	Presents a healthcare sustainability framework

planning with system objectives to achieve financial sustainability. Journal of Health Services & Research Policy. 2015;20(2): 109-114.		analysis, health services and nursing), relevant references included. Published in peer-reviewed journal		sustainability framework to identify determinants of healthcare expenditure, so that it can evolve with population needs				seems well balanced.			
Buchan J. What difference does ("good") HRM make? *Human Resources for Health [Electronic Resource]*. 2004;2(1):6.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Argument is clear and balanced	Yes	Worldwide context, relates discussion to meeting the sustainable development goals, and discusses the role of human resource management in the health system	Yes	Authors standpoint is clear on the importance of human resource management	Yes	Context of article identifiable. Key contemporary references included	Yes	Contributes the importance of implementing, disseminating and sustaining good HRM in health systems

Buchan JM, Naccarella L, Brooks PM. Is health workforce sustainability in Australia and New Zealand a realistic policy goal? *Australian health review : a publication of the Australian Hospital Association*. 2011;35(2): 152-155.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, peer reviewed	Yes	Australia and New Zealand context	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important argument that the health systems in Australia and New Zealand need more focus on prevention, and increasing the productivity of the health system
Burgess LH, Cohen MR, Denham CR. A new leadership role for	Yes	Authors have authority, relevant references included. Published	Yes	Aim and method well defined and adhered to	Yes	Worldwide, focusing on pharmacists as leaders	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable but date range of literature search not	Yes	Argues for the importance of pharmacist leaders

pharmacists: a prescription for change. *Journal of patient safety.* 2010;6(1):31-37.		in peer-reviewed journal						and based on peer-reviewed literature		disclosed. Key contemporary references included		
Casale CR, Clancy CM. Commentary: Not about us without us. *Academic Medicine.* 2009;84(10):1333-1335.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief to argue for the use of community-based participatory research for improving health care	Yes	Focus on United States of America health system	Yes	Author bias not stated, but recognises the bias in health care	Yes	Context of article identifiable. Key contemporary references included	Yes	Presents theoretical arguments for community-based participatory research in response to another article in the journal
Cashin A. The challenge of nurse innovation in the Australian context of universal health care.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on Australian context, with emphasis on nurses	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article in detailing the concept of universal heath care applied to Australia to

Collegian. 2015;22(3): 319-324.												empower nurse led health innovation
Chambers DA, Glasgow RE, Stange KC. The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change. Implement Sci. 2013;8:117.	Yes	Authors have authority, relevant references included	Yes	Aim of research is clear in responding to two frequent assumptions about sustainability (voltage drop and program drift)	Yes	Specific to United States of America health system	Yes	Bias not explicitly stated but authors standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Significant as it adds the Dynamic Sustainability Network to the literature
Coiera E, Hovenga EJ. Building a sustainable health system. Yearb Med	Yes	Authors have authority, relevant references included	Yes	Research aim identified and met	Yes	Worldwide, but focuses on the sustainability of current health systems	Yes	Bias not explicitly stated but is present	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article with advice on the measurement and improvement of

Inform 2007:11–8.												health system sustainability
Crisp N. What would a sustainable health and care system look like? *BMJ (Clinical research ed.).* 2017;358:j3895.	Yes	Authors have authority as a member of the House of Lords (and is talking specifically about the NHS), relevant references included. Published in peer-reviewed journal	Yes	Clear brief to argue that sustainability depends on seven factors and that cross-sectional partnerships are needed to increase resilience. No methodology provided	Yes	NHS specific	Yes	Authors standpoint is clear in their argument	Yes	No date specifically, but from 1978 at the Alma Ata Declaration onwards to time of publication (2017). Contemporary references also included	Yes	Recognition of some factors that need more attention, and also needs further underpinning by the economy and through creative partnerships
Delgado, P. 2016. Meeting the Challenge of Chronic Conditions in a Sustainable	Yes	Authors have authority, relevant references included. Published in peer-	Yes	Aim to explore the aims of the Atlantic Healthcare Collaboration for Innovation	Yes	Designed to answer or discuss the aim. No specific method section, but	Yes	Bias not explicitly stated but authors standpoint is clear and based on evidence	Yes	Context of article identifiable but not specific to a particular 'date' e.g., research in	Yes	Contributes questions and suggestions for future research

Manner: Building on the AHC Learning. Healthc Pap 15 Spec No:90-95; discussion 97-123.		reviewed journal		and Improvement in Chronic Disease (AHC) and its areas of success and possible improvement		qualitative and quantitative methods employed in a separate article		from past research		area was published in 2005, whilst opinion piece published in 2016. However, other key contemporary references included		
Dhalla I. Canada's health care system and the sustainability paradox. *Cmaj*. 2007;177(1):51-53.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief stated, view is balanced with arguments from opposing view	Yes	Specific to Canadian health system, with Ontario as an example	Yes	Bias not explicitly stated, but work seems well balanced and acknowledges counter-arguments	Yes	Context of article identifiable. Key contemporary references included	Yes	Argument is relevant and adds new ideas to existing literature
Edwards, N., M. Rowan, P. Marck, and D. Grinspun. 2011.	Yes	Authors have authority, relevant references included. Published	Yes	Clear aim and methods provided	Yes	Specific to Canadian healthcare system	Yes	Bias not stated, article is balanced and limitations are	Yes	Contemporary references included	Yes	Relevant to Canada's healthcare system

Understanding whole systems change in health care: the case of nurse practitioners in Canada. Policy Polit Nurs Pract 12 (1):4-17.		in peer-reviewed journal						acknowledged			
Ellner, A. L., S. Stout, E. E. Sullivan, E. P. Griffiths, A. Mountjoy, and R. S. Phillips. 2015. Health Systems Innovation at Academic Health Centers: Leading in	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim to argue for increased support for health innovators in academic health centres in the US, and define health system innovation	Yes	Define the scope of their article in introduction: defining health system innovation, distinguishing it from quality improvement, and examining career opportunities for	Yes	Argue that increased support is needed to advance health care goals in academic health centers	Yes	Context of article identifiable but not specific (identified as 21st century in article). Key contemporary references included	Yes	Relevant to US academic medicine, educating medical students, and trying to allow healthcare at a sustainable cost

a New Era of Health Care Delivery. Acad Med 90 (7):872-880. doi:10.1097/acm.0000000000000679.						those who will lead health systems innovation						
Fineberg HV. Shattuck Lecture. A successful and sustainable health system--how to get there from here. New England Journal of Medicine. 2012;366(11):1020-1027.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear examination of USA health system and how to increase its sustainability	Yes	American health care context	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable as after the 2010 Patient Protection and Affordable Care Act . Key contemporary references included	Yes	Recognises that many steps are needed to ensure a sustainable health system, and identifies characteristics of a sustainable health system
Gruen RL, Elliott JH, Nolan ML, Lawton	Yes	Authors have authority, relevant	Yes	Research aim and methods	Yes	Scope of article clearly defined	Yes	Author bias not stated but viewpoint	Yes	Context of article identifiable. Key	Yes	Contributes to conversation around

PD, Parkhill A, McLaren CJ, Lavis JN.		references included		stated and met				is balanced		contemporary references included		health system sustainability
Greenhalgh, T., F. Macfarlane, C. Barton-Sweeney, and F. Woodard. 2012. "If we build it, will it stay?" A case study of the sustainability of whole-system change in London. Milbank Q 90 (3):516-547. doi:10.1111/j.1468-0009.2012.00673.x.	Yes	Authors have authority, relevant references included	Yes	Research aim and methods stated and met	Yes	Based in London health system, but significance extends beyond that	Yes	Bias minimized through administering of questionnaire by blinded researchers	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article with significance for improving and scaling system change that can be applied to other health systems
Guyon A, Hancock T,	Yes	Authors have	Yes	Brief clear and met,	Yes	Focus on Canadian	Yes	Author bias not	Yes	Context of article	Yes	Identifies issues

Kirk M, et al. The weakening of public health: A threat to population health and health care system sustainability. *Canadian Journal of Public Health. Revue Canadienne de Sante Publique.* 2017;108(1):e1-e6.		authority, relevant references included. Published in peer-reviewed journal		no method provided		health system		explicitly stated, but standpoint is balanced		identifiable and discusses current government policy (at time of publication) in Canada. Key contemporary references included		with government approach to public health and responds to each
Hovenga EJ. Impact of data governance on a nation's healthcare system building blocks. *Studies in*	Partially	Authors have authority, relevant references included. Unable to determine if journal is peer-reviewed	Yes	Brief clear and met, no method provided	Yes	Worldwide, focusing on 'a nation' to explain national healthcare	Yes	Author bias not explicitly stated, standpoint based on reputable sources e.g., world health	Yes	Context of article identified as current. Key contemporary references included	Yes	Important article educating readers about IT and healthcare and sustainability of that

Health Technology & Informatics. 2013;193:24-66.								organisation				health system
Inotai A, Petrova G, Vitezic D, Kalo Z. Benefits of investment into modern medicines in Central-Eastern European countries. Expert review of pharmacoeconomics & outcomes research. 2014;14(1):71-79.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim clearly stated and adhered to. No method provided	Yes	Specific to Central Eastern European countries	Yes	Authors standpoint is balanced, citing research and the WHO	Yes	Context of article identifiable. Key contemporary references included	Yes	Relevant, useful arguments for Central Eastern European health systems to consider
Kepros JP, Opreanu RC. A new model for	Yes	Authors have authority, relevant	Yes	Brief stated and examines the	Yes	United States of America	Yes	Authors standpoint clear, bias not	Yes	Context of article identifiable. Key	Yes	Adds historical context to relationshi

health care delivery. *BMC health services research.* 2009;9:57.		references included. Published in peer-reviewed journal		evolving relationship between hospitals, medical schools and physicians		health system		explicitly mentioned		contemporary references included		p between medical schools, hospitals and physicians, and examines the shared vision for the future
Knutson, D. J. 1997. The role of strategic alliances in ensuring health care quality: a health care system perspective. Clin Ther 19 (6):1572-1578.	Partially	Authors have authority, but no references included	Yes	Brief clear and met, no method provided	Yes	Specific to HealthSystems Minnesota, but may be applicable more widely	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article that focuses on the Chronic Illness Management Research and Development Project (CIMRDP) in Minnesota
Lehoux P, Williams-Jones B, Miller F, Urbach D, Tailliez S. What leads	Yes	Authors are associated with reputable organisations in	Yes	Authors clear experts in the field within the Canadian Health	Yes	Coverage is worldwide with very broad factors of sustainabil	Yes	Authors have more knowledge regarding Canadian system than	Yes	Context of article identifiable. Key contemporary	Yes	Applicable worldwide for industrialized countries to adopt a

to better health care innovation? Arguments for an integrated policy-oriented research agenda. *Journal of Health Services & Research Policy*. 2008;13(4): 251-254.		their fields. Published in peer reviewed journal.		system, and contemporary references are cited. Published in peer reviewed journal		ity being discussed, drawing on a workshop at an International conference		worldwide and this is stated. The participants from the workshop at the Invitational Workshop of Innovations in Health, from which this paper arose, included participants from Canada, England, Wales, and Finland. The event was funded by various Canadian grants. This standpoint		references included		new kind of policy-oriented research based on relevance, usability and sustainability

								is clear by the Authors, and yet their opinion piece seems balanced				
Levin L, Goeree R, Levine M, et al. Coverage with evidence development: the Ontario experience. International journal of technology assessment in health care. 2011;27(2): 159-168.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes		Yes	Focus on health system in Ontario, Canada	Yes					
Lewis S. Can a learning-disabled	Yes	Authors have authority, relevant	Yes	Brief clear and met, no method provided	Yes	Focus on Canadian health system	Yes	Author bias not explicitly stated, but	Yes	Context of article identifiable. Key	Yes	Unique perspective, arguing for the

nation learn healthcare lessons from abroad? *Healthcare policy = Politiques de sante.* 2007;3(2):19-28.		references included. Published in peer-reviewed journal						standpoint is balanced		contemporary references included		focus on other aspects of the health system than its sustainability
Liaropoulos L, Goranitis I. Health care financing and the sustainability of health systems. *International journal for equity in health.* 2015;14:80.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Worldwide, but focusing on cost-effectiveness of health systems	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Investigates the sustainability of health care financing around the world
Lozano I, Rondan J, Vegas JM, Segovia E. Sustainability of the	Partially	Authors have authority, relevant references included.	Yes	Brief clear in replying to original article. No methods	Yes	Spanish health system context	Yes	Author bias not explicitly stated, but standpoint is	Yes	Context of article identifiable. Key contemporary	Yes	Argues that the Spanish health system has many

Health System: Beyond Cost-effectiveness Analyses. *Revista espanola de cardiologia (English ed.).* 2016;69(9): 880-881.		Journal not peer-reviewed						balanced in addressing original article's viewpoint and rebutting as appropriate		references included		strengths, but one of its weaknesses is the lack of sustainability
Mackenzie J. The old care paradigm is dead, long live the new sustainable care paradigm: how can GP commissioning consortia meet the demand challenges	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on United Kingdom	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable as beginning from 1948 until present. Key contemporary references included	Yes	Examines the significance of prevention rather than treatment to increase the sustainability of the health system

of 21st century healthcare? *London journal of primary care*. 2011;4(1):64-68.												
Magnan S, Fisher E, Kindig D, et al. Achieving accountability for health and health care. *Minnesota medicine*. 2012;95(11):37-39.	Partially	Authors have authority, relevant references included. Journal not peer-reviewed	Yes	Clear aim that is fulfilled, no method supplied	Yes	Focus on United States of America health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Recognises the importance of the triple aim in health care sustainability
McGorry PD, Hamilton MP. Stepwise expansion of evidence-based care is needed for mental	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief well defined and adhered to. No methodology present	Yes	focus on Australia and the mental health sector	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Recognises the challenges in the system of

health reform. *The Medical journal of Australia.* 2016;204(9):351-353.												
McIntosh E, Nagelkerk J, Vonderheid SC, Poole M, Dontje K, Pohl JM. Financially viable nurse-managed centers. *Nurse Pract.* 2003;28(3):40, 46-48, 51.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not clear, but brief clear and examples used to explain argument. Peer reviewed	Yes	Focus on the role of finance committees in nurse managed centres in the United States of America	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article on nurse managed centres and how they function
Nagle LM, Pitts BM. Citizen perspectives on the future of healthcare.	Partially	Authors have authority, relevant references included. Journal	Yes	Brief clearly stated and met. No methods provided	Yes	Focus on health system in Ontario, Canada	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Date is explicit (comments on the panel that met from April-June	Yes	Summaries the recommendations for sustainability from the unique

Healthcare Quarterly. 2012;15(2): 40-45.		not peer-reviewed							2011). Contemporary references also included		panel of Ontarians
Pacifico Silva H, Lehoux P, Miller FA, Denis JL. Introducing responsible innovation in health: a policy-oriented framework. *Health Research Policy & Systems*. 2018;16(1): 90.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Research aim identified and met. No method provided	Yes	Worldwide, with examples from the United States and European Union	Yes	Author bias not explicitly stated, but bias of technologies being discussed is explicitly stated	Yes	Context related to responsible research and innovation in health, and thus is centred on when the research on this topic increased	Yes	Contributes a responsible innovations in health framework, with nine dimensions organised into five domains
Pencheon D. Developing a sustainable health and care system: lessons for	Yes	Authors have authority, relevant references included. Published in peer-	Yes	Brief clear and met, no method provided	Yes	England NHS context	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context identified as the five years previous to publication in 2013 (where	Yes	Important article highlighting ways in which the health system can be sustained

research and policy. *Journal of Health Services & Research Policy*. 2013;18(4): 193-194.		reviewed journal								future-proofing the health care was attempted)		
Pronovost, P. J., C. G. Holzmueller, T. Callender, R. Demski, L. Winner, R. Day, J. M. Austin, S. M. Berenholtz, and M. R. Miller. 2016. Sustaining Reliability on Accountability Measures at The Johns Hopkins Hospital. Jt	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not explicit, but article brief is provided. Methodology provided and adhered to	Yes	Specific and well defined: Johns Hopkins Hospital in 2012-2014	Yes	Authors clear that they conducted previous research in measuring results of sustainability improvement measures (2012) and the author's efforts to sustain them	Yes	Clear date acknowledged from 2012 (initial results) to 2013	Yes	Suggests quality could improve through applying the framework used at Johns Hopkins Hospital (JHH)

Comm J Qual Patient Saf 42 (2):51-60.												
Robertson TM, Lofgren RP. Where population health misses the mark: breaking the 80/20 rule. *Academic Medicine.* 2015;90(3): 277-278.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	No aim, but brief clearly stated. Relevant references included. Published in peer reviewed journal.	Yes	United States health context	Yes	Bias not explicitly stated but states the aim to reduce health care spending through analysis of medical insurance claim records	Yes	Context of article identifiable. Key contemporary references included	Yes	Adds to the argument of the importance of identifying health spending and working on reducing it where possible
Rosenberg-Yunger ZR, Daar AS, Singer PA, Martin DK. Healthcare sustainability and the challenges of innovation to	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief comprising three parts to review government response to biopharmaceuticals and health system	Yes	Focus on Canada health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Contributes recommendations for the field regarding access to biopharmaceuticals

biopharmaceuticals in Canada. *Health policy (Amsterdam, Netherlands).* 2008;87(3): 359-368.				sustainability								
Rosser, M. 2006. Advancing health system integration through supply chain improvement. Healthc Q 9 (1):62-66, 64.	Partially	Authors have authority, but no references included	Yes	Research aim identified and met	Yes	Focus on Canadian health system	Yes	Clear from the article even though bias is not specifically mentioned that the stance of the article is that HMMS are beneficial	Yes	Context of article covers from 1997 (inception of HMMS) and 2006 (article publication). No references included	Yes	Significance evident in the "lessons learned" section
Scott IA. Is modern medicine at risk of losing the plot? *The Medical*	Yes	Authors have authority, journal is peer-reviewed	Yes	Examines if pledges by Australian Government for improvem	Yes	Speficic to Australian population health care spending, and the private	Yes	Clear opinion but well balanced argument	Yes	Context of article identifiable. Key contemporary	Yes	Relevant, adds context to Australian health. Encourages different

journal of Australia. 2006;185(4):213-216.				ents to health care are sustainable financially, and in terms of behaviour change on the front line		health insurance system of Australia				references included		aspects of the health system to work together
Sepehri A, Chernomas R. Is the Canadian health care system fiscally sustainable? *International Journal of Health Services.* 2004;34(2):229-243.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clearly described and met. No methodology	Yes	Specific to Canadian context	Yes	Contains well balanced review of literature, and compares the health systems of Canada and the United States	Yes	Context of article identifiable. Key contemporary references included	Yes	Argued for the best way to increase the sustainability and economic viability of the national Canadian health system
Shigayeva A, Coker RJ. Communicable disease	Yes	Authors have authority, relevant references included.	Yes	Aim clearly stated and met. No methodology	Yes	Worldwide context, but focus on disease control programs	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiable. Key contemporary	Yes	Important article that proposes characteristics and a framework

control programmes and health systems: an analytical approach to sustainability. *Health policy and planning.* 2015;30(3): 368-385.		Published in peer-reviewed journal						is balanced		references included		that may have the potential for sustainability
Sonnenreich P, Geisler L. Covering the Cost of the Cure: From Hepatitis C to Cancer, New Therapies Are Straining a System Plagued by Inefficiency. *P T.* 2016;41(9): 565-589.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not clear, but brief clear and examples used to explain argument. Peer reviewed	Yes	Focus on United States of America health system	Yes	Author bias not explicitly stated, but standpoint is balanced with research from other researchers and articles	Yes	Context of article identifiable. Key contemporary references included	Yes	Examines the evolving notions of value in healthcare, cost vs cure,

Stoelwinder JU, Paolucci F. Sustaining Medicare through consumer choice of health funds: lessons from the Netherlands. *Medical Journal of Australia.* 2009;191(1):30-32.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, peer reviewed	Yes	Focus on how Australia can learn from the Netherlands health system	Yes	Author bias not explicitly stated, but standpoint is balanced. Authors are affiliated with Australian institutions	Yes	Context of article identifiable as contemporary (comments on 2008 funding agreement in Australia, but Netherlands health policies since 1941. Published in 2009) . Key contemporary references included	Yes	Extracts the application to Australia of the Netherlands policies.
Stoelwinder JU. Final report of the National Health and Hospitals Reform	Yes	Authors have authority, relevant references included. Published in peer-	Yes	Brief clear and met, no method provided	Yes	Specific to Australian health system	Yes	Author bias not explicitly stated, but standpoint is balanced. Also of	Yes	Context of article identifiable and there is explicit reference to the actions of	Yes	Timely article suggesting changes to Australian health system

Commission: will we get the health care governance reform we need? *The Medical journal of Australia.* 2009;191(7):387-388.		reviewed journal						note, author declares conflict of interest as they are a board member of Medibank Private		the National Health and Hospitals Reform Commission and federal government response. Key contemporary references included		
Stuart N, Adams J. 2007. The sustainability of Canada's healthcare system: a framework for advancing the debate. Healthcare Quarterly 10: 96–103.	Partially	Authors have authority, relevant references included. Journal not peer-reviewed	Yes	Brief clear and met, no method provided, peer-reviewed	Yes	Focus on Canadian health care	Yes	Author bias not explicitly stated, but standpoint is balanced and bias within the healthcare system is identified and discussed	Yes	Context of article identifiable. Key contemporary references included	Yes	Examines the importance of improving the sustainability of the Canadian health system

Taylor M. Australian health care reform: a place for nurse practitioners? Aust Nurs J. 2007;15(6): 20-23.	Partially	Author information not available, journal not peer-reviewed. However, relevant and peer-reviewed references are included	Yes	Clear brief to discuss role of NPs in Australia and how the role can be sustainable	Yes	Focus on the role of nurse practitioners in Australia	Yes	Author bias not explicitly stated, but standpoint is justified by numerous government reports	Yes	Context of article identifiable as after the 2010 Patient Protection and Affordable Care Act . Key contemporary references included	Yes	Recognises and emphasises the emerging role of the nurse practitioner, and how it can be sustained
Thompson RE. Sustainability as the lynch pin of public policy and industry initiatives. *Physician executive.* 1998;24(4): 52-55.	Partially	Authors are associated with reputable organisations in their field. However, journal is not peer-reviewed	Partially	No clearly stated brief, starts with USA health political history and then to discuss managed care	Yes	American population health	Partially	Authors standpoint is clear in their argument. However, it is not particularly balanced in presentation.	Partially	Context of article identifiable. Majority of references are not contemporary	Yes	Promotes discussion regarding healthcare in the USA, and if and how managed care can be sustainable
Tsasis P. Chronic disease management and the	Yes	Authors have authority, relevant references	Yes	Brief clear and met, no method provided	Yes	Focus on health system in Ontario, Canada	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiable. Key contempor	Yes	Important article, justified in terms of health of

home-care alternative in Ontario, Canada. Health Serv Manage Res. 2009;22(3): 136-139.		included. Published in peer-reviewed journal						is balanced		ary references included		Canadians , and financial improvem ent
Van de Pas R, Hill PS, Hammonds R, et al. Global health governance in the sustainable developme nt goals: Is it grounded in the right to health? *Global challenges (Hoboken, NJ).* 2017;1(1):4 7-60.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief regarding analysis of the roots of the sustainabl e developme nt goals in the right to health	Yes	Worldwid e, focusing on the sustainabl e developme nt goals	Yes	Author bias not explicitly stated, but standpoint is balanced and urban bias is discussed	Yes	Context of article identifiabl e as post-2015 sustainabl e developme nt goals. Key contempor ary references included	Yes	Unique argument, questions if the sustainabl e developme nt goals satisfy the right to health, and concludes that they do not
Veillard J, Denny K. Transforma	Yes	Authors have authority,	Yes	Clear brief in observatio	Yes	Focus on Canadian health	Yes	Author bias not explicitly	Yes	Context of article identifiabl	Yes	Argues five points regarding

tion through Clinical and Social Integration: Meeting the Needs of High Users of Healthcare. *Healthcare Papers.* 2014;14(2): 4-7.		relevant references included. Published in peer-reviewed journal		ns regarding the use of the health system by a minority of the population		system, especially Ontario, but message is applicable worldwide		stated, but standpoint is well balanced with arguments on many perspectiv es discussed		e. Key contempor ary references included		Ontario's health system and the potential for improvem ent
Wakerman J, Humphreys JS. Sustainable workforce and sustainable health systems for rural and remote Australia. *The Medical journal of Australia.* 2013;199(5	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Specific to rural and remote Australia	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiabl e. Key contempor ary references included	Yes	Recognise s interdepen dence of the health system of urban and rural areas

Suppl):S14-17.												
Woodward, G. L., A. Iverson, R. Harvey, and P. G. Blake. 2015. Implementation of an agency to improve chronic kidney disease care in Ontario: lessons learned by the Ontario Renal Network. Healthc Q 17 Spec No:44-47.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	The aim is adhered to, but there is no relevant methodology.	Yes	Limits of article known (to identify lessons learnt from the CKD agency to improve care)	Yes	Argument that the CKD system has been effective and sustainable	Yes	Context of article identifiable. Key contemporary references included	Yes	Identifies methods used for improving CKD care and their success
Pisco L, Pinto LF. From Alma-Ata to Astana: the path of	Yes	all authors from reputable institutions		peer reviewed, but no aim or methodology	Yes	Portugal only	Yes		Yes	recent references included	Yes	

Primary Health Care in Portugal, 1978-2018 and the genesis of Family Medicine. Ciencia & saude coletiva. 2020											
Ganann R, Peacock S, Garnett A, et al. Capacity development among academic trainees in community-based primary health care research: The Aging, Communi	Yes	all authors from reputable institutions	Yes	clear aim and adhered to	Yes	context clearly stated and clear limits	Yes	bias not explicitly stated	Yes	recent references included	Yes	

ty and Health Research Unit Experience. Prim Health Care Res Dev. 2019;20:e139.												
Jessup RL, O'Connor DA, Putrik P, et al. Alternative service models for delivery of healthcare services in high-income countries: a scoping review of systematic reviews. BMJ	Yes		Yes		Yes		Yes		Yes		Yes	

open. 2019;9(1): e024385.												
Vainieri M, Noto G, Ferre F, Rosella LC. A Performance Management System in Healthcare for All Seasons? International Journal of Environmental Research & Public Health [Electronic Resource]. 2020;17(15):03	Yes	all authors from reputable institutions	Yes		Yes	Explicitly mentions bias	Yes		Yes	recent references included	Yes	
Braithwaite J, Mannion	Yes	all authors from reputable	Yes	relevant references	Yes	includes informatio	Yes		Yes	recent references included	Yes	adds meaningfully and

R, Matsuyama Y, et al. The future of health systems to 2030: a roadmap for global progress and sustainability. International journal for quality in health care: journal of the International Society for Quality in Health Care. 2018;30(10):823-831.		institutions and published extensively in field				n on 152 countries						enriches current literature

Buttigieg SC. Innovation Strategies and Health System Guiding Principles to Address Equity and Sustainability in Responsible Innovation in Health Comment on "What Health System Challenges Should Responsible Innovation in Health Address? Insights	Yes	all authors from reputable institutions	Yes		Yes		Yes	notes need to address contextual differences	Yes	recent references included	Yes	

From an International Scoping Review". Int. 2019;8(9): 570-572											
Byskov J, Maluka S, Marchal B, et al. A systems perspective on the importance of global health strategy developments for accomplishing today's Sustainable Development Goals. Health policy and planning.	Yes	all authors from reputable institutions worldwide	Yes	aim clearly stated and met	Yes	coverage based on aim being met	Yes	balanced standpoint	Yes	relevant contemporary references included	Yes	brings suggested ways forward to achieve the SDGs

2019;34(9):635-645.												
O'Brien N, Li R, Isaranuwatchai W, et al. How can we make better health decisions a Best Buy for all?: Commentary based on discussions at iDSI roundtable on 2 (nd) May 2019 London, UK. Gates open research. 2019;3:1543.	Yes	all authors from reputable colleges, peer reviewed article	Yes	peer reviewed, authorative references	Yes	covers health technology assessment (HTA)	Yes	bias not explicitly stated but balanced standpoint with WHO and country and local evidence	Yes	contemporary references included	Yes	adds to the literature
Hanney S, Kanya L, Pokhrel S,	Yes	WHO authority, as well as	Yes	authoritative, clear aim met	Yes	scoping review parameters	Yes	bias not explicitly stated but	Yes	Contemporary	Yes	Has considerations for

Jones T, Boaz A. WHO Health Evidence Network Synthesis Reports. What is the evidence on policies, interventions and tools for establishing and/or strengthening national health research systems and their effectiveness? Copenhagen: WHO Regional Office for Europe © World Health		individual authors				well defined		balanced standpoint with WHO and country and local evidence		references included		policy analysis in many countries

Organization 2020.; 2020											
Braithwaite J, Vincent C, Nicklin W, Amalberti R. Coping with more people with more illness. Part 2: new generation of standards for enabling healthcare system transformation and sustainability. International Journal for Quality in Health	Yes	well published authors in the field	Yes	authoritative references in the field, aim strategy met	Yes	global, but strategy for ISQua well defined	Yes	balanced standpoint, evidence from sources from around the world	Yes	context well defined, contemporary references used	Yes	important paper adding to literature

Care. 2019;31(2):159-163												
Braithwaite J, Zurynski Y, Ludlow K, Holt J, Augustsson H, Campbell M. Towards sustainable healthcare system performance in the 21st century in high-income countries: a protocol for a systematic review of the grey literature. BMJ open.	Yes	well published authors in the field	Yes	authoritative references	Yes	global but well defined protocol	Yes	balanced standpoint, bias explicitly addressed	Yes	date to be used well defined, contemporary references used	Yes	significant and important for the field

2019;9(1): e025892												
Martiniuk AL, Colbran R, Ramsden R, et al. Capability ... what's in a word? Rural Doctors Network of New South Wales Australia is shifting to focus on the capability of rural health professionals. Rural and remote health. 2020;20(3):5633	Yes	authoritative authors	Yes	authoritative references	Yes	coverage well defined	Yes	balanced standpoint	Yes	contemporary references included	Yes	important and adds to the field
Rudnicka E,	Yes	peer revied	Yes	Peer-reviewed	Yes	aimed to coverage	Yes	Authors standpoint	Yes		Yes	

Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. The World Health Organization (WHO) approach to healthy ageing. Maturitas. 2020;139:6-11.		journal article				global perspective and achieved it		is clear, relatively balance presentation				
Walsh K. Strengthening primary care: the role of e-learning. Educ. 2019;30(5):267-269.	Yes	Author has a strong publication record in peer reviewed journals	Yes	peer reviewed	Yes		Yes	no bias stated but is a balanced commentary	Yes	contemporary references included, date is discernible by subject matter	Yes	
De Santis M.	Yes	Authors both	Yes	peer reviewed	Yes	Looking at studies	Yes	No bias stated,	Yes	recent references	Yes	

Integrated care for healthcare sustainability for patients living with rare diseases. Annali dell'Istituto superiore di sanita. 2019;55(3):276-282.		appear to have roles in prominent rare disease organisations in Europe				published between 2000 and 2018. Search terms provided, both grey lit and PR included		standpoint is clear		included, date is discernible	
Ferrelli RM, Fantini B, Taruscio D. Health systems sustainability for rare diseases. Preface. Annali dell'Istituto superiore di sanita.	Yes	Authors either work for rare diseases network in Europe or in the ministry of health in Italy	Yes	Book chapter-editors are all from reputable organisations	Yes	Europe specific with focus on rare diseases	Yes	No bias stated, standpoint is clear	Yes	Contemporary references, the context is very clear	Yes	

2019;55(3):249-250.												
Steenhuis S, Struijs J, Koolman X, Ket J, E VDH. Unraveling the Complexity in the Design and Implementation of Bundled Payments: A Scoping Review of Key Elements From a Payer's Perspective. Milbank Quarterly. 2020;98(1):197-222.	Yes	Authors have peer reviewed publication history	Yes	Aim stated, clear methodology	Yes	Limits stated in the methodology- review related to payment methods, relevant to OECD countries	Yes	Authors address risk of bias, there is a balanced standpoint presented	Yes	Contemporary references included, date is discernible throughout the text	Yes	
Nikolić B. Applicability of	Yes	contemporary references,	Yes	aim clearly	Yes	clear coverage within EU	Yes	authors opinion is balanced	Yes	context clear, contempor	Yes	important article that helps

European Union Competition Law to Health Care Providers: The Dividing Line between Economic and Noneconomic Activities. Journal of health politics, policy and law. 2020.		author from reputable source		stated and met				by contemporary references and different standpoints		ary references present		make the legal uncertainty clear
Niraula S. Strategizing health technology assessment for containment of cancer drug costs in a	Yes	authoritative author, detailed reference list	Yes	clearly stated brief, peer reviewed article	Yes	coverage specific to Canadian oncology drug review	Yes	balanced standpoint	Yes	universal health care system in Canada since 1968, and has been deduced with contemporary references	Yes	adds context, important yet specific article

universal health care system: Case of the pan-Canadian Oncology Drug Review. Cancer. 2019;125(18):3100-3103.												
Wurcel V, Cicchetti A, Garrison L, et al. The Value of Diagnostic Information in Personalised Healthcare: A Comprehensive Concept to	Yes	authors experts in the field	Yes	peer-reviewed article, clear aim and methodology	Yes	coverage specific to the VODI published articles	Yes	balanced standpoint with examples and references	Yes	contemporary references included,	Yes	important addition regarding value of diagnostic information (VODI)

Facilitate Bringing This Technology into Healthcare Systems. Public Health Genomics. 2019;22(1-2):8-15.												
Cunningham FC, Ranmuthugala G, Westbrook JI, Braithwaite J. Tackling the wicked problem of health networks: the design of an evaluation framework. BMJ	Yes	authors authoritative in field, detailed reference list	Yes	clearly stated aim and methods adhered to. Work is representative of the field	Yes	evaluations of systematic reviews to date	Yes	balanced standpoint	Yes	date discernable, contemporary references present	Yes	meaningful contribution to literature

open. 2019;9(5): e024231.												
Embi PJ, Richesson R, Tenenbaum J, et al. Reimagining the research-practice relationship: policy recommendations for informatics-enabled evidence-generation across the US health system. JAMIA open. 2019;2(1): 2-9.	Yes	authoritative authors from well-respected institutions	Yes	clear aim highlighted and met	Yes	specific to covering what was discussed and the findings from the 2016 AMIA meeting	Yes	balanced standpoint with contributions from over 70 participants at meeting	Yes	discernable from references as well as timing of meeting reported on	Yes	synthesised findings from meeting and adds to literature
Park YL, Canaway R. Integrating	Yes	authoritative authors	Yes	peer reviewed journal	Yes	limits clearly stated with Western	Yes	bias not explicitly stated, but expert balanced	Yes	date discernable, contemporary	Yes	interesting and unique article,

Traditional and Complementary Medicine with National Healthcare Systems for Universal Health Coverage in Asia and the Western Pacific. Health syst. 2019;5(1): 24-31.						Pacific region		standpoint drawing on experiences from many countries		references present		adds to the literature
Quaglio G, Figueras J, Mantoan D, et al. An overview of future EU health systems. An insight	Yes	Authors have all previously published extensively in this field	Yes	Published in peer reviewed journal. Aim isn't explicitly presented, but article is referencing/ reporting	Yes	EU specific context	Yes	Author bias isn't stated, but discussion presents clear standpoint and is balanced	Yes	References workshop in 2017 that inspired the publication, references recent literature	Yes	Contributes meaningfully to discussion of HSS in the EU

into governance, primary care, data collection and citizens' participation. Journal of public health (Oxford, England)				on workshop held in parliament								
Lehoux P, Roncarolo F, Silva HP, Boivin A, Denis JL, Hebert R. What Health System Challenges Should Responsible Innovation in Health Address? Insights	Yes	Authors have strong publication record in PR journals	Yes	aim stated, methods clearly stated, published in PR journal aim stated, methods clearly stated, published in PR journal	Yes	international scoping review with well defined parameters and search strategy	Yes	Bias isn't stated but limitations of review are, and standpoint is balanced	Yes	Articles included for review span 2000-2016.	Yes	Very detailed scoping review, identifies a number of challenges facing global health systems

From an International Scoping Review. Int. 2019;8(2): 63-75.												
Editorial. Healthcare quarterly (Toronto, Ont.). 2020;22(4)		Authors not stated- editors of Healthcare Quarterly- a		Commentary- no aim or methods	Yes	Canada specific	Yes	Standpoint clear	Yes	Context is article is identifiable because of contemporary references		
Abimbola S, Baatiema L, Bigdeli M. The impacts of decentralization on health system equity, efficiency and resilience: a realist synthesis	Yes	Authors from reputable institutions with good publication records in peer reviewed journals	Yes	clear methodology/ search strategy. In peer reviewed journal. No aim explicitly stated	Yes	wide coverage- looking at low/middle and high income countries	Yes	Author bias not stated, but balanced standpoint	Yes	context of article identified	Yes	identified three mechanisms by which decentralization may influence equity, efficiency, and resilience in 25 countries (low

of the evidence. Health Policy & Planning. 2019;34(8):605-617												middle and high income)
Craig N, Robinson M. Towards a preventative approach to improving health and reducing health inequalities: a view from Scotland. Public health. 2019;169:195-200.	Yes	Both authors affiliated with the NHS	Yes	no aims or method stated but is peer reviewed and well referenced	Yes	Scotland specifc	Yes	Author bias not stated but viewpoint is clear	Yes	Context easy to discern based on references and analysis of trends in previous 10-15 years	Yes	Useful in Scottish context
Costa-Font J, Levaggi R. Innovation, aging,	Yes	Both authors have strong publication history	Yes	Peer reviewed, no aim or method stated	Yes	special issue presents papers presented	Yes	There isn't a bias stated	Yes	discernable from refrences	Yes	

and health care: Unravelling "silver" from "red" herrings? Health Econ. 2020;29 Suppl 1:3-7.		and are associated with reputable institutions. Published in peer reviewed journal				at a workshop						
Derakhshani N, Doshmangir L, Ahmadi A, Fakhri A, Sadeghi-Bazargani H, Gordeev VS. Monitoring Process Barriers and Enablers Towards Universal Health Coverage	Yes	Authors have strong publication history	Yes	detailed methods and search strategy	Yes	parameters defined in search strategy	Yes	bias not stated, viewpoint clear	Yes	context is discernable	Yes	

Within the Sustainable Development Goals: A Systematic Review and Content Analysis. ClinicoEconomics and outcomes research : CEOR. 2020;12:459-472												
Clancy C. Creating World-Class Care and Service for Our Nation's Finest: How Veterans Health Administration		Author affiliated with VA, no publication record	Yes	in peer reviewed journal	Yes	restricted to VA			Yes	date and context discernable from text		

Diffusion of Excellence Initiative Is Innovating and Transforming Veterans Affairs Health Care. Perm. 2019;23												
Marcotte LM, Moriates C, Wolfson DB, Frankel RM. Professionalism as the Bedrock of High-Value Care. Academic Medicine.	Yes	authors have strong publication record	Yes	peer reviewed	Yes	No limits stated, but is restricted to looking at healthcare professionals (in US context)	Yes	bias not explicitly stated, but standpoint is balanced	Yes	date/ context discernable from text	Yes	

2020;95(6):864-867.												
Witter S, Palmer N, Balabanova D, et al. Health system strengthening-Reflections on its meaning, assessment, and our state of knowledge. International Journal of Health Planning & Management. 2019;34(4):e1980-e1989	Yes	authors have strong publication record	Yes	peer reviewed, but there is no aims or methods	Yes	Looked at studies published between 2000 and 2018 focussed on interventions in LMIC	Yes	acknowledgement of biases and limitations; well balanced standpoint	Yes	context discernable from references	Yes	contributes to the literature
Sturmberg JP. Resilience for health-	Yes	author has publication record in this field	Yes	peer reviewed, but there is no aims or methods		limits not stated		no bias stated		no discernable date	Yes	contributes to conversation around health

an emergent property of the "health systems as a whole". Journal of evaluation in clinical practice. 2018;24(6):1323-1329.												system resilience
Thistlethwaite JE, Dunston R, Yassine T. The times are changing: workforce planning, new health-care models and the need for interprofessional education	Yes	authors from reputable institutions	Yes	peer reviewed	Yes	Specific to Australia/ the Australian health system	Yes	bias not explicitly stated, but standpoint is balanced	Yes	references contemporary reports about Aus health system. Context is discernable	Yes	

in Australia. Journal of interprofessional care. 2019;33(4):361-368.												
Iskrov G, Stefanov R, Ferrelli RM. Health systems for rare diseases: financial sustainability. Annali dell'Istituto superiore di sanita. 2019;55(3):270-275	Yes	authors have strong publication record	Yes	No clear aim stated, but there is clear methodology and paper has been peer reviewed	Yes	covers health systems in EU member states	Yes	balanced standpoint	Yes	references contemporary reports about health systems in the EU-context is very clear	Yes	contributes to the literature

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	4
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	4-5
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	6-7
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	8
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	9-10, methods paragraph 2
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	10, methods paragraph 3
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	11, methods paragraph 3 and table 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	10-12
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	N/A
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	10, methods paragraph 5
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	10

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	11-13, synthesis of results and discussion section
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	12-13, results paragraph 3
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	12-13, results paragraph 3 and 4
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	13
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	10-13, results paragraphs 1-4
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 13-23
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	24, paragraph 2
Limitations	20	Discuss the limitations of the scoping review process.	5, strengths and limitations paragraph
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	26, conclusion paragraph
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	28

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE?
A SCOPING REVIEW

ADDITIONAL FILE 4: INCLUSION AND EXCLUSION CRITERIA

Table 1. Inclusion and exclusion criteria

Inclusion Criteria*	Exclusion Criteria
1. Definition(s) of healthcare systems performance sustainability. 2. Measurement of SPHS. 3. Discussion and identification of the challenges involved in SPHS. 4. Discussion or identification of ways in which to improve SPHS. 5. Discussion of sustaining and scaling change in SPHS.	1. Pertaining to sustainability relating to: a. Disaster management, pandemic or other emergency preparedness. b. Foreign aid or foreign investment. c. Workplace health and safety. d. Environmental sustainability. 2. Of no relevance to the Australian context: a. Low-income countries. b. Healthcare systems in conflict zones. c. Specific to a country's political situation. 3. Does not otherwise deal with sustainability of 'healthcare systems' (e.g., concerned with diagnosis or management of a single disease or improvements in a single healthcare setting). 4. Focuses on broad population healthcare initiatives rather than healthcare delivery systems (e.g., vaccination programs). 5. Does not otherwise address the objectives of this review 6. High risk of bias or low quality.

*To be eligible for inclusion, articles needed to demonstrate one or more of the inclusion criteria.

BMJ Open

How can the Healthcare System Deliver Sustainable Performance? A Scoping Review

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-059207.R1
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HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

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HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

Abstract

Background: Increasing health costs, demand, and patient multimorbidity challenge the sustainability of healthcare systems. These challenges persist and have been amplified by the global pandemic.

Objectives: We aimed to develop an understanding of how the sustainable performance of healthcare systems (SPHS) has been conceptualised, defined, and measured.

Design: Scoping review of peer reviewed articles and editorials published from database inception to February 2021.

Data sources: PubMed and Ovid Medline, and snowballing techniques.

Eligibility criteria: We included articles that discussed key focus concepts of SPHS: 1) definitions, 2) measurement, 3) identified challenges, 4) identified solutions for improvement, and 5) scaling successful solutions to maintain SPHS.

Data extraction and synthesis: After title/abstract screening, full-text articles were reviewed, and relevant information extracted and synthesised under the five focus concepts.

Results: Of 142 included articles, 38 (27%) provided a definition of SPHS. Definitions were based mainly on financial sustainability, however, SPHS was also more broadly conceptualised and included acceptability to patients and workforce, resilience through adaptation, and rapid absorption of evidence and innovations. Measures of SPHS were also predominantly financial, but recent articles proposed composite measures that accounted for financial, social and health outcomes. Challenges to achieving SPHS included the increasingly complex patient populations, limited integration because of entrenched fragmented systems and siloed professional groups, and

the ongoing translational gaps in evidence-to-practice and policy-to-practice. Improvement strategies for SPHS included developing appropriate workplace cultures, direct community and consumer involvement, and adoption of evidence-based practice and technologies. There was also a strong identified need for long term monitoring and evaluations to support adaptation of healthcare systems and to anticipate changing needs where possible.

Conclusions: To implement lasting change and to respond to new challenges, we need context-relevant definitions and frameworks, and robust, flexible, and feasible measures to support the long-term sustainability and performance of healthcare systems.

Keywords: healthcare system sustainability, sustainable performance of healthcare systems, healthcare services, value in healthcare

Strengths and limitations of this study

- This scoping review addresses a knowledge gap by providing a comprehensive synthesis of the literature including definitions, measurement, challenges, solutions for improvement, and scaling up successful solutions to maintain sustainable performance of healthcare systems (SPHS).
- The review methodology was guided by the PRISMA-ScR statement, and we searched multiple databases and used complementary snowballing techniques to increase comprehensiveness.
- The use of the Hawker and AACODS quality appraisal tools provided an assessment of the quality of literature on the sustainable performance of healthcare systems.

- Our review is limited in scope to countries with health systems of relevance to Australia, and this limits the generalizability of our results to low- or middle-income countries.

Background

Globally, healthcare spending is tracking above and beyond economic growth[1]. Challenges facing healthcare systems include an ageing population and subsequent rise of chronic diseases and multimorbidity[2, 3] and increasingly expensive new medical technologies[3, 4]. It is estimated that approximately 30% of care delivered by healthcare systems is low-value, attributable mainly to administrative overheads, bureaucracy, over-diagnosis, overtreatment or other factors[5]. Systems lacking coordination and integration across clinical disciplines and healthcare sectors also result in wasteful spending through both care duplication and omission of needed care[6]. If healthcare spending follows current trajectories, governments suggest that healthcare systems will begin to become unaffordable[3]. This leads us to the question: "what is the current thinking about interventions and initiatives to make healthcare systems more sustainable?" Understanding how healthcare system sustainability is conceptualised underpins the implementation and evaluation of system-wide interventions that aim to improve performance. Although literature about the sustainability of individual innovations and improvement programs is growing,[7] the broad question of whole-of-system sustainability is rarely studied.

Sustainability itself has remained an ambiguous topic in the literature. Sustainability suggests that healthcare systems should be built to last, and able to adapt and endure, ensuring that resources are expended efficiently and responsibly to maintain or improve individual and population health and wellbeing[8]. To be sustainable, a healthcare system must adequately deliver across financial, social, and environmental concerns[4]. This triple bottom-line is difficult to achieve consistently over time. For example, sustainable health services may need additional short-term investments to be financially beneficial in the long-term[1].

The healthcare system is defined as one that delivers care to those who need it across many different settings. It includes key components: capacity- including physical, capital, and human assets; organisational structure, both formal and informal; finances- including mechanisms for funding allocations, ownership, and solvency; patients or clients and their characteristics and needs; and care processes and infrastructure[9].

Healthcare system sustainability is difficult to measure in practice and requires ongoing long-term monitoring and evaluation of appropriate indicators. One potential way to conceptualise and operationalise sustainability is an assessment of the sustainable performance of healthcare systems (SPHS). Although past reviews have addressed the sustainability of improvement programs and policies in the healthcare system,[7, 10, 11] they did not specifically address how SPHS is conceptualised in the medical literature. As a response, this study was designed using a systems science lens to fill this gap in knowledge by reviewing publications that report on or discuss the SPHS.

Objectives

This scoping review of health and medical literature aims to develop an understanding of how SPHS has been conceptualised, defined, and measured, and to scope the identified challenges and potential solutions to achieving and maintaining SPHS.

Methods

Study Design

In keeping with scoping review methodology,[12] our inclusion criteria were broad, and our search was comprehensive to capture the state of knowledge about SPHS. We included literature reviews, primary empirical articles (including qualitative, quantitative, and mixed methods studies), case studies, opinion pieces, and editorials published in English from database inception to February 2021. To be included, studies had to report on, or discuss in detail, aspects of healthcare systems sustainability, resilience, or performance improvement, and could cover improvements in cost-effectiveness, affordability, safety, quality, equity, or access, whilst creating or realising value (Table 1). Only articles that addressed the research objectives and provided insights into current knowledge of sustainability in healthcare delivery systems were included. Articles on environmental sustainability; those investigating discrete improvement programs implemented in specific healthcare settings including studies on specific diseases or programs (for example studies on vaccination programs for a specific disease); and studies with a specific focus on COVID-19 were out of scope, as we applied a system-wide lens rather than a disease-specific focus (Table 1).

Table 1. Inclusion and exclusion criteria

Inclusion Criteria*	**Exclusion Criteria**
1. Definition(s) of healthcare systems performance sustainability. 2. Measurement of SPHS. 3. Discussion and identification of the challenges involved in SPHS. 4. Discussion or identification of ways in which to improve SPHS.	1. Pertaining to sustainability relating to: a. Disaster management, pandemic or other emergency preparedness. b. Foreign aid or foreign investment. c. Workplace health and safety. d. Environmental sustainability. 2. Of no relevance to the Australian context: a. Low-income countries. b. Healthcare systems in conflict zones. c. Specific to a country's political situation.

5. Discussion of sustaining and scaling change in SPHS.	3. Does not otherwise deal with sustainability of 'healthcare systems' (e.g., concerned with diagnosis or management of a single disease or program or improvements in a single healthcare setting). 4. Focuses on broad population healthcare initiatives rather than healthcare delivery systems (e.g., vaccination programs). 5. Does not otherwise address the objectives of this review 6. High risk of bias or low quality.

*To be eligible for inclusion, articles needed to demonstrate one or more of the inclusion criteria.

Information Sources

In consultation with an experienced university medical librarian, we developed a search strategy using key words and MeSH terms and conducted an advanced search of PubMed and Ovid Medline (Additional File 1). Additional relevant articles were identified by hand searching reference lists of included articles (snowballing).

Study Selection

Guided by the Preferred Reporting Items for Systematic review and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) statement,[13, 14] and the methodological framework for scoping reviews,[12] screening of the article titles and abstracts was conducted by four reviewers (JH, JHD, GD and EM) using the predetermined inclusion and exclusion criteria (Table 1). Reviewers screened a 5% of sample of the titles and abstracts whilst applying the inclusion and exclusion criteria and the team then met to discuss any discrepancies, before screening continued. The full-text review was then conducted by a second reviewer team (JHD, YZ, GD, IM and GL) in consultation with JH and EM. Discrepancies were resolved in team meetings in consultation with JB as arbitrator.

Quality Assessment of Individual Studies

To understand the scope of the quality of included articles, Hawker et al.'s Quality Assessment Tool was applied as it enables quality assessment among many different article types including quantitative, qualitative, or mixed-methods empirical research studies or literature reviews[15]. The Quality Assessment Tool contains nine categories (abstract and title; introduction and aims; method and data; sampling; data analysis; ethics and bias; results; transferability or generalizability; and implications and usefulness) and a total quality score can be calculated (maximum score=36), where higher scores denote higher quality[15-17]. For quality assessment of opinion or commentary pieces, the Authority Accuracy Coverage Objectivity Date Significance (AACODS) Checklist was used[12, 17].

Data Extraction

Characteristics of included articles, year of publication, country of origin, and article type were tabulated. A purpose-designed Excel spreadsheet was used to extract relevant details from each article. The Excel spreadsheet was piloted by three reviewers on five articles and adjusted as needed.

Patient and Public Involvement

No patients or public were involved.

Results

Study Selection

Of 5675 articles identified in the database searches, 2404 were duplicates, leaving 3271 articles. Undertaking independent title and abstract screening of 5% of articles, two reviewers achieved an acceptable level of agreement (Kappa = 0.6)[18]. A further 2750 articles were excluded, leaving 521 articles for full-text review. A substantial level of agreement was achieved on review of 5% of full text articles undertaken independently by four reviewers JHD, YZ, GD and IM; (Kappa = 0.7)[18]. After full-text review, 136 articles were included. Eighty-three additional articles were identified from snowballing, and six met the inclusion criteria, for a total of 142 articles included for data extraction (Figure 1). See Additional File 2 for further details.

[Insert **Figure 1.** PRISMA flow diagram summarising the review and reasons for article exclusion* here]

Study Characteristics

Of the included articles, 18 were review articles (either systematic or narrative), 82 were editorial or opinion pieces, 37 were primary empirical studies, and five were a brief narrative review combined with an empirical study (classified as empirical for simplicity). Empirical studies used a wide variety of data collection techniques and included qualitative analysis of interviews,[19] survey results,[20, 21] analysis of hospital data records,[22, 23] and economic analysis[24-28]. The included articles described studies that covered various geographic locations, most commonly Canada (n=22), the United States of America (n=22), Australia (n=23, including two which involved Australia and New Zealand), the United Kingdom (n=6), the Netherlands (n=2), and one each from the following countries Austria, Italy, Northern Ireland, Malaysia, Malta, New Zealand, Oman, the Philippines, Portugal, Scotland and Spain. The remainder of studies referred to geographical regions such as the European Union, or to multiple nations, for example one

included the United States of America, the United Kingdom, and Australia[29] and another included Australia, Ireland, Austria and Denmark[30].

The data extraction sheet included the citation, study aims, study design, themes addressed, and additional relevant information about SPHS. Details of the 142 included articles are summarised in Additional File 2. Of the 142, most identified challenges (n=94, 66%) and proposed ways to improve SPHS (n=89, 62%) while fewer discussed measuring SPHS (n=48, 34%), or sustaining and scaling change (n=47, 33%) and fewer still provided any definition of SPHS (n=38, 27%).

Quality of Included Studies

Forty-three empirical studies scored 25-34 points on the Hawker's Quality Assessment Tool,[15] and 29 were of high quality, 13 moderate quality, and one borderline low quality[16]. None were excluded due to low quality (Additional File 3). The quality of editorial and opinion pieces (n=99) was analysed according to the AACODS criteria, and 72 articles ranked 'yes' for all criteria indicating high quality (Additional File 3).

Defining SPHS

Definitions of SPHS were provided by 38 publications including 25 opinion pieces, seven review articles, and six empirical studies (Table 2). The definitions fell into three broad groupings: 1) fiscal sustainability, 2) human resource sustainability and acceptance of change by stakeholders, and 3) system adaptability and improvement (Table 2). Definitions focused on continual improvement,[29] and embeddedness of changes into the healthcare system in the long term[31-33].

Several articles defined SPHS in terms of fiscal sustainability[24, 32-37]. Examples included discussions of sustainability of rural primary care services in the face of ongoing policy change to reimbursement and practice incentives,[36] adoption of new funding models to ensure availability of medicines,[24] and hospital capital investments to improve patient access to care[35]. Articles also discussed the importance of balancing financial interests with social and ecological interests[38]. Several papers conceptualised SPHS as the continuation of programs after the cessation of external program-specific funding[39-41].

Four articles[42-45] discussed SPHS through the lens of a learning healthcare system, a system in which 'science, informatics, incentives, and culture are aligned for continuous improvement and innovation'[46]. These articles focussed predominantly on using data and evidence to support system adaptability and improvement over time.

Table 2. Definitions of SPHS

Definition	**Exemplar Quotes**	**Relevant References**		
		Empirical articles	Editorials or opinion pieces	Reviews
Fiscal sustainability	"The WHO considers fiscal sustainability as a requirement, rather than an objective, of health financing policy. Sustainability of healthcare financing therefore cannot be interpreted as a reduction of healthcare costs, but rather as a predictable growth or control of health expenditures."[24]	[35, 36, 47, 48]	[24, 32-34, 37, 39, 49]	[40, 41, 47, 50, 51]
Human resource sustainability and acceptability	"It has been increasingly recognised that getting HR policy and management "right" has to be at the core of any sustainable solution to health system performance"[32, 52]	[48]	[32-34, 38, 49, 52-58]	[31, 51]

to stakeholders	"A sustainable health system also has acceptability to key constituents, including patients and health professionals." [33]			
Adaptability and improvement over time to create a future-focused intervention	"A sustainable health system … [has] adaptability, because health and health care needs are not static (i.e., a health system must respond adaptively to new diseases, changing demographics, scientific discoveries, and dynamic technologies in order to remain viable)."[33] "Ensuring that sufficient resources are available over the long term to provide timely access to quality services that address Canadians' evolving health needs."[59]	[36, 43]	[4, 33, 39] [42, 49, 55-65]	[31, 50, 51, 66, 67]

Measuring SPHS

The measurement of SPHS was addressed through theoretical discussions across the 24 editorials and seven review articles, and by proposing, developing, or applying frameworks or indicators in 17 empirical studies (Table 3). These frameworks and indicators were heterogeneous and included financial, social and healthcare outcomes[68] with some articles highlighting the limitations of widely used financial metrics[34, 69]. Although heterogeneous,[40] measures were undertaken at three broad outcome levels: 1) Individual (e.g., continued health benefits for patients or healthcare providers); 2) Organisational (e.g., continuation of innovations, hospital-level fiscal improvements); or 3) Community (e.g., continued use of programs, services or healthcare interventions).

A variety of new SPHS measures were proposed, developed, modified, or tested in research environments[20, 22, 45, 66, 70, 71] to address current deficits in available measures (Table 3).

For example, the Q*Scale was designed to combine data on caseload, patient satisfaction and physician aptitude, such that changes in hospital performance could be more effectively monitored[70]. In contrast, the Dynamic Sustainability Framework (DSF) seeks to investigate the fit between the intervention, practice settings, contexts and cultures, healthcare policies, and the broader ecology within which healthcare systems operate, including socio-political systems[39]. Similarly, the Health Care Sustainability Framework (HCSF) and the Responsible Innovations for Health (RIH) framework, recognise the importance of accounting for the needs and trends of the population, workforce, and financial constraints[72, 73]. Alternative models utilising a scoring system (e.g. using the Resilience Indicator) were based on data-driven simulation modelling,[74] or theoretical composite indicators of the value of healthcare systems[74, 75].

Table 3. Summary of established and novel frameworks suggested for measuring SPHS

Established framework name	**Rationale for use**
Organisational Change Model (OCM)	To measure the success of sustained organisational change, according to faculty member survey respondents [71]
Analysis of hospital records (e.g., payroll records)	Measuring staff turnover, workforce supply and financial sustainability [22, 26]
Evaluation of health networks	To evaluate the effectiveness and sustainability of health networks [76]
Novel framework name	**Rationale for development**
Q* Scale	To measure performance at the hospital level [70]
Dynamic Sustainability Framework (DSF)	To investigate the fit between the intervention, the practice setting, and the ecological system [39] To improve measurement of SPHS beyond patient outcomes only [40]
Resilience Indicator	To highlight the systemic relevance of primary care network systems to quantify healthcare resilience [74]
eMergy (embodied energy) Sustainability Index	To address the lack of qualitative indicators for sustainability [66]

Future Health Index (FHI)	To identify preparedness of countries to building sustainable health systems [75]
Health Care Sustainability Framework (HCSF)	To measure the relationships between political and fiscal sustainability of an intervention [72]
Responsible Innovations for Health (RIH) Framework	To identify interventions that suitably address five domains (population health, healthcare system, economic, organisational, environmental)[73]
Research Lifecycle Framework	To enhance the impact of the Learning Health System by operationalising research innovations into clinical practice [45]
Value Of Diagnostic Information (VODI) Framework	To outline the multidimensional benefits and potential of healthcare diagnostics [77]

Identified Challenges to SPHS

Ninety-four articles, including 60 editorials, 22 empirical studies and 12 reviews, identified challenges to SPHS across three main themes: 1) increasingly complex patient populations; 2) ongoing gaps between evidence, policy and practice; and 3) concerns of system fragmentation and need for integration for a more streamlined adoption and sustainment of interventions.

Increasingly complex patient populations,[3, 23, 49, 74, 78-84] including patients with multi-morbidity[21, 48, 74, 79, 80, 82, 85, 86] and greater demand for effective aged care, under already strained healthcare budgets[3, 27, 49, 57, 87-92] were frequently discussed. The increasing demands and expectations of patients for healthcare of the highest quality challenges healthcare systems to meet this demand[4, 21, 79, 80, 82, 93, 94].

The gaps between evidence, policy and practice[40, 95, 96] continue to threaten SPHS as does limited investment in building workforce capacity and stakeholder involvement[30, 43]. The

challenge of increasing public scrutiny and the need to balance financial, environmental, and social sustainability were also recognised[28, 38, 63, 97, 98].

The fragmented nature of healthcare systems including power imbalances among the health professions, and resistance to changes in the scope of practice was reported to limit team approaches to care[99, 100]. Siloed care delivery models can become misaligned with the complexity of the healthcare system and the complexity of patient needs[55, 72, 101, 102]. Other publications reported lack of collaboration between public and private hospitals[91, 103] and widening gaps in care quality in rural/remote regions due to limited resources[23, 36, 91, 104]. Poor integration of primary care with the broader healthcare system was also seen as challenging SPHS[67, 81].

Opportunities for Improvement of SPHS

To address the challenges posed requires more than a one-time simple "fix". Continued adaptation in response to local contexts, and ongoing monitoring and evaluation are required to support the sustainment of effective solutions and to anticipate future needs and solutions[71]. Twelve review articles, 19 empirical articles, and 56 editorials discussed opportunities to improve SPHS.

Greater strategic investment in the system,[34, 62, 69, 88, 89] including funding novel interventions,[26, 40, 53, 98, 105] and capacity building programs for staff[30, 106] were advocated. Workplace culture in healthcare was identified as an important factor for SPHS. The importance of physician well-being was highlighted,[44, 95, 107, 108] and was strongly linked with organisational culture[17]. The importance of mentorship, teaching and leadership were also

highlighted as enablers of organisational improvements[19, 43, 94, 95]. Building healthcare system cultures that support medical graduates was viewed as crucial[38, 108-110]. Promoting incentives for generalist doctors to practice rurally was thought to address the current geographical gap in access to healthcare[44, 104, 109-111].

The promotion of desired attitudes, values and ideals of healthcare organisations was also recognised for achieving SPHS. Specifically, the value of patient-centred care and evidence-based medicine[30, 44, 65, 79, 84, 85, 111, 112], and collaboration between and within healthcare facilities and disciplines was highlighted as important for SPHS[42, 48, 103, 112-115]. Support by management that values the workforce, uses robust data-driven hospital management systems, and accessible, shared electronic medical record systems was also acknowledged as vital[93, 116].

The importance of political stability and bridging the jurisdictional-federal divide in federated healthcare systems (such as in the US, Canada, and Australia) was important for effective unified healthcare system functioning[24, 51, 88, 89, 117, 118]. It is not only organisational culture in healthcare,[119] but the broader organisation, governance and regulation of the healthcare system that are important for SPHS[64, 120, 121].

Community involvement is an important factor that bolsters capacity to implement and sustain change[116]. Empowering patients to care for their own health, and building confidence among caregivers to deliver some aspects of care, reduces burden on the healthcare system[79]. Community involvement via Community Based Participatory Research bolstered equity and

improved outcomes of care[122] and responding to recommendations from citizen panels also improved SPHS[92, 115, 123].

As technology advances, so does the ability to harness it to promote the sustainability of healthcare systems[33]. For example, point-of-care electronic prompts were used in one study of hospital surgical wards to decrease rates of hospital-acquired infections[124]. Embedding artificial intelligence and big data analytics hold promise to support efficient and effective service delivery to improve SPHS[55]. Other studies have suggested greater adoption of telemedicine to reduce travel time and costs[4] as complementary support to patients,[105] to improve diagnostics,[77] and as a platform to promote prevention of illness,[23] as contributing to SPHS.

Sustaining and Scaling Change in SPHS

Forty-seven articles addressed this theme, including nine reviews, 11 empirical articles and 27 editorials. As interventions are often implemented with limited and/or short-term (2-3 year) evaluation plans, demonstrating SPHS is often elusive[40]. Robust evaluations using relevant SPHS indicators embedded alongside implementation, from the outset to support adaptations and decisions about ongoing investments were advocated[51, 125]. One article proposed that federal funding agencies should perceive funding implementations of health innovations as ongoing strategic investments rather than time-limited projects[42].

The importance of accepting changes or adaptations to proposed interventions were also highlighted [126, 127]. For example, Greenhalgh *et al*[127] reported on a three-year case study follow-up of a healthcare system transformation and found that adaptations of the intervention to local contexts was important for sustainment of the intervention.

A recurring sentiment in the articles reviewed was the importance of support for the continuation of interventions from leaders and stakeholders[65, 78, 116, 119, 128, 129]. Leaders and managers have a clear role in supporting staff throughout the processes of reforms and changes, by providing opportunities for co-design, education including e-learning, and building peer networks[62, 130] whilst creating open communication to involve front-line staff in planning and implementation[116, 131]. For example, one article suggested that pharmacists should be involved in developing hospital discharge procedures to improve medication safety and adherence[132]. In more recent articles, policy makers and political leaders are highlighted as important change agents, as long as they work in concert with front-line health staff[51, 129, 133].

Transparent healthcare policies and algorithms for equitable distribution of healthcare funds was advocated, and particularly prioritised by rural areas[36, 69]. Beyond the government, communities and multi-sectorial partners,[49] and collaborations among hospitals, medical schools and physicians were also highlighted as vital for SPHS[68].

Although publications in our review predominantly urged for the sustainability of innovations, recent literature also highlights the need for discontinuation or redesign of programs that have become ineffective or irrelevant over time[4, 39, 127]. This is important to achieve sustainability as it ensures that value is maintained in the healthcare system[134].

Discussion

Definitions of SPHS were rarely offered, with only 27% of included articles providing any definition of SPHS whilst referring to the concept of SPHS. When definitions were provided, they mainly centred on financial and workforce sustainability, and a variety of concepts related to adaptability, improvement, and innovation for the future. The lack of definitions and variability in definitions creates significant limitations for the interpretation of the current body of literature on SPHS. As a first step to address this limitation, we would urge authors discussing SPHS to provide a definition that is relevant to their context. Furthermore, there were interesting contrasts in the boundaries adopted to describe the 'healthcare system' in the included papers which has also been identified by others[135]. For example, some studies measured SPHS at a single hospital level,[70] whereas others addressed it at a national system level,[136] making comparisons across studies difficult. In the future, as evidence about SPHS develops it may be possible to create nuanced measures, definitions, and approaches to SPHS as applied to different healthcare system levels and contexts.

The long-standing approach to measuring SPHS in terms of financial outcomes is increasingly becoming more sophisticated through the development of newer more nuanced frameworks and indicators that account for health and societal benefits whist factoring in the complex and dynamic nature of healthcare systems. Although new frameworks and measures, for example the Future Health Index,[75] the Q*Scale[70] and the Resilience Indicator[74] have been proposed, the evidence for the practical application of such frameworks and measures in the real world was limited.

The most common opportunities for improving SPHS related to building supportive and functional workplace and organisational cultures that promote collaboration, transparency, patient

centredness and community participation. The adoption of technological advances including greater use of linked up information technology platforms to provide intelligence about aspects of SPHS were also discussed in the literature[4, 23, 33, 105, 124]. Importantly, policy and political stability over time was also recognised as a supportive factor for SPHS, especially when implementing innovations and interventions that require longer term horizons to demonstrate their impacts on SPHS[24, 40, 51, 88, 89, 96, 117, 118]. This aligns with findings from a recent systematic review that specifically focused on the sustainability of health improvement programs[44].

The increasing adoption of pragmatic implementation trials in healthcare research is an important advance to support effectiveness testing in real-life situations rather than in contrived randomised controlled trials that are difficult to implement at scale in real-world settings to meet the needs of changing populations[46, 131].

Table 4 provides a summary of the current evidence about SPHS under five headings: defining sustainability; measuring it; associated challenges of realising sustainable performance; identifying opportunities for improvement; and creating, sustaining and scaling SPHS. This provides an important starting point for future research in the field.

Table 4. Summary of key findings under the five SPHS focus areas analysed in this review

Criteria	Explanation	Key points from included articles
Defining sustainability	What do we mean by SPHS?	- SPHS is difficult to define [29, 31-33] - Sustainability is most often framed in terms of fiscal/financial or economic sustainability [4, 24, 32-37, 66]

		- Sustaining a system intervention post-implementation and initial funding period [39-41]
Measuring	How do we measure SPHS?	- Issue of system boundaries—at which level should we measure sustainability? (e.g., at the individual hospital or healthcare system level) [70, 136] - Heterogeneous outcome data collection techniques (e.g., individual, organisation and community level) [34, 40, 68, 69] - Wide variety of new methods and indicators suggested (see Table 3) [20, 22, 66, 70, 71, 73]
Associated challenges	What challenges are associated with SPHS?	- Complex patient population (e.g., ageing, comorbidities and chronic illnesses) [3, 4, 21, 27, 49, 78-80, 85-91, 93] - The chasm between evidence and practice and policy and practice [26, 28, 34, 40, 53, 62, 63, 69, 88, 89, 95-98, 105, 106] - Fragmentation and gaps (e.g., power imbalances between healthcare personnel, rural versus urban services, fragmentation between public and private hospitals) [36, 71, 72, 91, 99-101, 103]
Opportunities for improvement	What helps improve SPHS?	- Workplace culture (e.g., mentorship, leadership, support for health professionals) [17, 19, 95, 104, 107, 109, 110] - Organisational culture (e.g., promoting collaborative attitudes, transparency, patient-centred care and political stability) [24, 79, 85, 88, 89, 93, 103, 113, 116-118] - Consumer and community involvement to align the system with needs (e.g., patient reported measures, in research, focus groups, and consumer panels) [79, 116, 122, 123] - Implementing technological advances (e.g., e-health) [4, 23, 33, 105, 124]
Sustaining and scaling	What initiatives for have been used to improve and maintain to SPHS (or value)?	- Setting up interventions for sustainability (e.g., extended initial funding periods, ongoing evaluation feedback loops, using pragmatic trial designs) [40, 98, 124, 137] - Support from all stakeholders [49, 62, 78, 116, 128, 130-132] - Developing cross-sectoral, interdisciplinary relationships and collaborations [36, 68, 69, 79]

	- Ability of intervention to adapt and flex depending on the context of implementation [127]

Strengths and Limitations

Methodological strengths of the current review include the use of the PRISMA-ScR statement to guide the review, including searching multiple databases and using snowballing techniques to increase comprehensiveness. Although formal quality appraisal is not recommended for scoping reviews, we felt it was important to also understand the scope of the quality of articles being published in addition to understanding their content and findings about SPHS.

As described above, the heterogenous nature of the current literature and limited use of definitions and frameworks made synthesis challenging. Our choice to limit the current review to studies reporting on SPHS in high-income countries further limits generalisability to other settings including in low- and middle-income countries (LMICs).

Future research directions

This article summarises the current scope of the literature on SPHS and provides an important starting point for future research. Although new SPHS measures and frameworks that include factors other than financial inputs and outputs have been proposed, their usefulness needs to be evaluated in the real-world healthcare ecosystem in the future. Taking a broad system-wide lens, our focus was on the SPHS in healthcare delivery settings and did not specifically consider individual programs for specific diseases, conditions or settings. In addition, the role of preventative care and broader public health prevention measures such as vaccination programs, should be a focus for future research. Research on the specific effect of the COVID-19 pandemic on SPHS is warranted to inform future responses to similar broad-ranging global threats to

SPHS[124, 125]. Understanding the scope of SPHS in LMICs is important for the future development of SPHS and future research is needed to summarise current knowledge, interventions, programs and measures of SPHS in these settings.

Conclusion

There is broad agreement that the sustainability of healthcare systems and their performance levels are increasingly being challenged. Our review confirms that the concept of SPHS is important and is frequently discussed in the health and medical literature. The field of SPHS is expanding with recent publications defining SPHS in terms other than the traditional financial measures. This places more emphasis on acceptability of the system to patients, healthcare providers and other stakeholders, adaptation and resilience, and sufficient nimbleness to absorb new evidence and innovations to support continuous improvements.

It is unlikely that we will, nor should we, settle on a single definition of SPHS. We would favour definitions that are robust but flexible to ensure their utility in the many and varied healthcare system contexts, however, authors and editors should strive to ensure that a definition is provided in any discussions of SPHS. We need sophisticated yet practical indicators of SPHS that capture sustainability beyond the traditional financial measures. Such measures have been proposed in the research literature, but their utility needs to be tested in real-world settings. The current literature suggests that SPHS is improved by strengthening of workplace cultures, continuous workforce development, direct health consumer and community involvement, and swift adoption and embedding of new evidence and technologies that are proven to have an advantage over current practice.

List of Abbreviations:

AACODS	Authority Accuracy Coverage Objectivity Date Significance
DFS	Dynamic Sustainability Framework
HCSF	Health Care Sustainability Framework
OCM	Organisational Change Model
PRISMA	Preferred Reporting Items for Systematic review and Meta-Analysis
RIH	Responsible Innovations for Health
SPHS	Sustainable Performance of Healthcare Systems
WHO	World Health Organisation

Additional Files

Additional File 1: SEARCH STRATEGY (Zurynski_HerkesAdditionalFile1-search strategy.docx)

Additional File 2: SUMMARY OF INCLUDED PAPERS (Zurynski_HerkesAdditionalFile2-summary of included papers.docx)

Additional File 3: QUALITY ASSESSMENT (Zurynski_Herkes_AdditionalFile3-quality assessment.docx)

Declarations

Ethics approval and consent to participate

Not applicable.

Authors' contributions

JB conceptualised the study and led the team's work. EM, JHD, JH and YZ developed the search strategy. EM, JHD, JH, GL, GD, and YZ conducted the abstract review, and JHD, GD, GL, IM and YZ full-text review and data extraction, with JB acting as arbitrator when needed. JHD, IM

and GD conducted the quality assessment. YZ and JHD drafted the manuscript with input from GD and NKH, and all authors contributed their comments and approved of the final version of the manuscript.

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Competing interests

There are not competing interests.

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Availability of data and materials

All data relevant to the study are included in the article or uploaded as supplementary information

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Figure titles legends and footnotes

FIGURE 1.

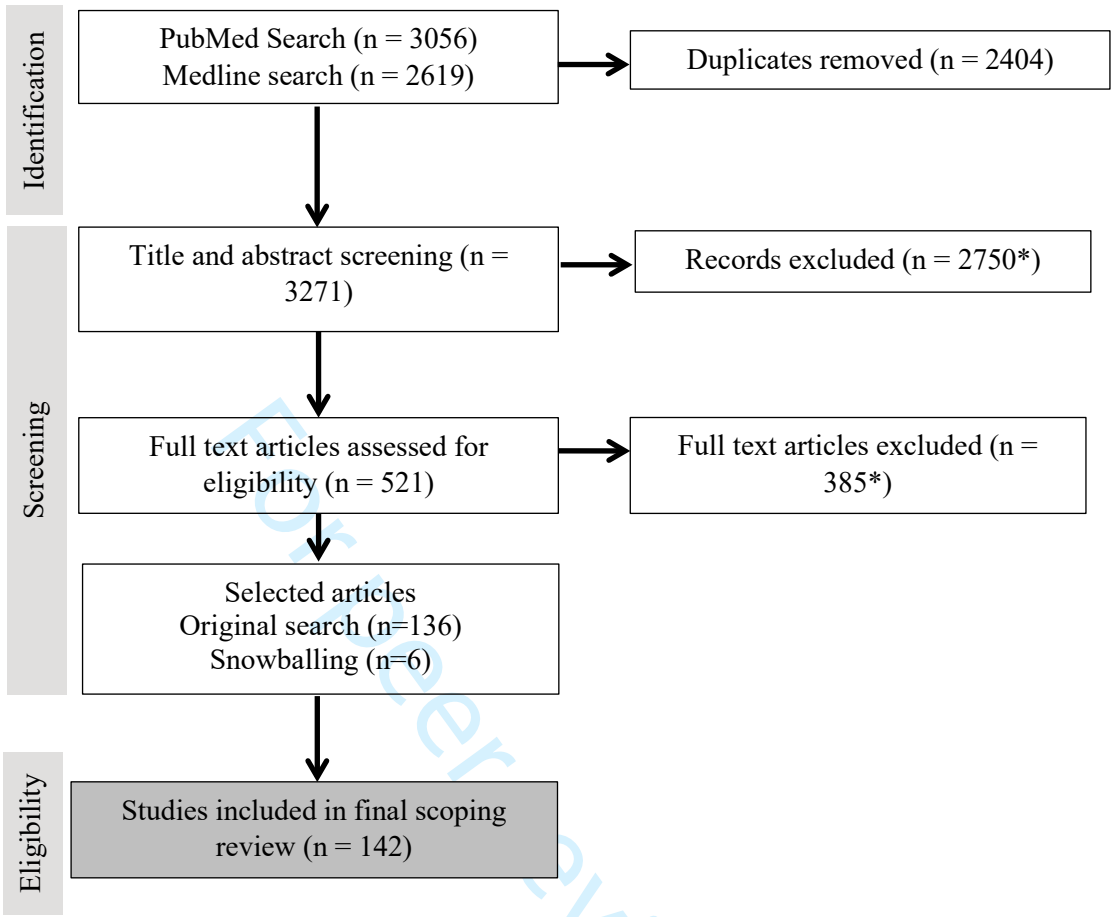
Title:

Figure 1. PRISMA flow diagram summarising the review and reasons for article exclusion*

Footnotes:

*Full text articles and snowballed articles excluded for the following reasons. Note that some articles were excluded for multiple reasons. Reasons for article exclusion are below:

Reason	Excluded at title/abstract screening (N)	Excluded at full text review (N)
Disaster or emergency	199	3
Foreign aid, equity, or community healthcare	598	20
Occupational health and safety	69	2
Environmental sustainability	89	5
Not relevant to Australia e.g. low-resource setting	730	82
Not about systems e.g., single disease or program	1291	109
Preventative e.g., regarding vaccination or nutrition	277	18
Not relating to healthcare delivery e.g., regarding animal care or food safety	46	0
Regarding physiology/pharmacology	44	0
Does not in another way define, measure, identify challenges, opportunities for improvement or scale up of sustainability in the healthcare system	398	166
Other e.g., article not written in English, full text not available	4	95



HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE?
A SCOPING REVIEW

ADDITIONAL FILE 1: SEARCH STRATEGY

	PubMed	**Ovid Medline**
	((sustainab*[Title/Abstract]) OR resilien*[Title/Abstract]) AND (((((“health system*”[Title/Abstract]) OR “health system* performance”[Title/Abstract]) OR “health system* improvement”[Title/Abstract])	“health system* performance” “health system* improvement” (health adj3 system) 1 OR 2 OR 3 (sustainab* OR resilience*) 4 AND 5
Additional Limits	English Language	English Language
Yield	3056 articles	2619 articles

HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

ADDITIONAL FILE 2: SUMMARY OF INCLUDED PAPERS

Summary of included studies in scoping review and reasons for inclusion

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Al Dhawi AA, West DJ, Jr., Spinelli RJ, Gompf TA. 2007	2007	Oman	ED			Increased consumer expectations, increased medication costs, and resource constraints	The environment, financial sustainability, institutional sustainability, demand sustainability	The need to examine the entire system: social, economic, and environmental determinants of health to sustain changes in the health system	
Amalberti, R., W. Nicklin, and J. Braithwaite. 2016.	2016	Worldwide	ED			Ageing population, patients with comorbidities, and expensive health conditions to treat			
Ament SMC,	2014	Netherlands	EM					The importance of internal	

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Gillissen F, Moser A, Maessen JMC, Dirksen CD, von Meyenfeldt MF, et al. 2014								auditing and feedback of outcomes, (e.g., reminders and meetings), changing organisational structure	
Armstrong BK, Gillespie JA, Leeder SR, Rubin GL, Russell LM. 2007	2007	Australia	ED			1. Demography of disease and ageing population; 2. Increasing medical cost; 3. Health workforce supply and distribution; 4. Problems with the quality and safety; 5. Balancing private and public health; 6. Recognition in the importance	Solutions must include elements of prevention, and primary and acute rehabilitation services		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
						of investing in the health of the next generation; 7. Urban planning for sustainable communities; 8. Inequity in health			
Atmore C. 2015	2015	New Zealand	ED			Doctors are becoming more specialised, but needs to become more generalist to look after the whole person	Transalpine service model (developed in a rural NZ hospital) provides options for sustainable healthcare in the future		
Barasa EW, Cloete K, Gilson L. 2017	2017	Worldwide	ED	Resilience is an important quality for creative adaptation		The challenge of thinking of everyday resilience rather than just crises			
Bessler JS, Ellies M. 1995	1995	Australia	ED			Admissions rise, and doctors are using technology more regularly. Public	Need to decrease the number of beds in the public hospitals (as 15% of inpatients should not be,		

Article demographics				*Reason for article inclusion and summary of results*					
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						expenditure on healthcare has remained 'flat' but private healthcare premiums continue to escalate	according to research), increase continuity of patient care (termed 'integrated networks'), and have less of a divide between state and federal health systems		
Birch S, Murphy GT, MacKenzie A, Cumming J. 2015	2015	Worldwide	ED		Healthcare sustainability framework (HCSF), showing the relationship between expenditure levels, the determinants of expenditure, revenues to support the healthcare system, and	The unintended consequences of redistributing cost of care and responding to the needs of the population e.g., redistributes what socio-economic groups use healthcare	Sustainability frameworks should consider the needs and trends of the population, the work force, financial and service information		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
					their relationship to fiscal and political sustainability				
Braithwaite, J., D. Marks, and N. Taylor. 2014	2014	Australia	RA	Sustainability defined as the mid-to-long-term acceptance of a program		Looks at the need to improve implementation science, leading to sustainability	Sustainability was one of eight key factors in implementing changes in the health system	Sustainability needs to be considered from the inception of change programs and projects, and there needs to be commitment at a managerial level	
Bramesfeld, A., F. Amaddeo, J. Caldas-de-Almeida, G. Cardoso, A. Depaigne-Loth, R. Derenne,	2016	European Union Countries	EM		Measure and compare different countries using the QMP-MHC scale	Recognises the challenge of bridging policy and practice			

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
V. Donisi et al. 2016.									
Buchan J. 2004.	2004	Worldwide	ED	Argues that a HR policy is central to any sustainable health system performance changes	Must be sector specific measures e.g., staff per occupied bed, patient acuity measures	The lack of consistent human resource management (HRM), as well as lack of being able to fit HRM to organisational characteristics, context and priorities, and link this to sustainable improvements. No single intervention is likely to be effective in all contexts.		There is low take-up of HRM interventions	
Buchan JM, Naccarella L, Brooks PM. 2011	2011	Australia and New Zealand	ED	The ability for Australia and New Zealand to train enough	Measurement is limited, e.g., can see if healthcare staff have	Brings into question attitudes of the country towards skilled			

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				health staff to fill the positions for their front-line health staff to reduce the reliance on international recruitment	received a qualification from a country outside Australia, but not how long they have been working in Australia	personnel, immigration, funding of the education sector to train new health personnel (and the time commitment to train new health professionals must also be considered, as must the benefits of overseas personnel for national policy makers)			
Burgess LH, Cohen MR, Denham CR. 2010	2010	Worldwide	ED			Minimizing adverse drug events (ADEs) (and therefore readmissions) by having pharmacist leaders	Pharmacists need to become leaders to change hospital organisational and safety culture, working within an inter-disciplinary team to ensure	Pharmacists should be involved in medication counselling during the discharge process, and follow-up after the transition to	

Article demographics				*Reason for article inclusion and summary of results*					
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							medication and medication issues are managed appropriately. Should also establish a medication review board to investigate near misses, being engaged in teamwork and communication, helping implement computerized systems, and being involved in patient training for discharge	home after hospital discharge	
Buttigieg SC, Schuetz M, Bezzina F. 2016	2016	Malta	EM			The need for public and private hospital services to work together to solve complex healthcare problems and	Collaboration between private and public sectors may involve: 1. a regulated semi-competitive health model, whereby the		

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						benefit both entities	government sets costs (e.g., for specific tests) and citizens are encouraged to invest in private health insurance; 2. Public-private mix model, which makes care more comprehensive and complete; or 3. Public-private partnerships (PPPs)		
Buykx P, Humphreys JS, Tham R, et al. 2012	2012	Australia	EM	Providing appropriate and cost-effective care in a way that persists in or can adapt to environment. Should also positively influence the broader		In rural health services, sustainability is threatened by small population size and lack of economy of scale, poorly management structures, low socioeconomic		Rural health services are enabled by supportive policy and state and federal support	

Article demographics				*Reason for article inclusion and summary of results*					
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				sustainability of the wider community		groups, and geographic isolation			
Casale CR, Clancy CM. 2009	2009	United States of America	ED				Improving equity in health through community-based participatory research (CBPR). A component of this research is to plan for long-term process and commitment		
Cashin A. 2015	2015	Australia	ED	A health system must address all aspects of its sustainability, including financial, social and political elements		Being unsure if future conservative governments could threaten universal healthcare, and encouraging nurse innovation in Australia		Issue of encouraging government support that will be politically costly in the short-term, but beneficial in the long term	

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Chambers DA, Glasgow RE, Stange KC. 2013	2013	Worldwide	ED	The continued positive effects of the intervention after the external funding have ended. This is expected to be constantly evaluated, developed and improved	The dynamic sustainability framework (DSF) was created to investigate the fit between the intervention, the practice setting, and the ecological system	Two assumptions of sustaining interventions are challenged: 1. 'voltage drop' where interventions yield lower benefits as they are put into practice outside a laboratory setting; and 2. 'program drift' where programs become less effective due to changes in protocol as it is delivered	Ensure focus on sustainability from the beginning of implementation of the intervention, rather than post-implementation. The setting for the intervention is also important e.g., it should focus on organisational learning, stakeholders should be involved		
Cho CC, Ramanan RA, Feldman MD. 2011	2011	United States of America	EM		Used analysis of nomination letters for mentor awards to analyse what it is to be a good mentor		Through mentors being role models and legacies for the future		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Coiera E, Hovenga EJ. 2007	2007	Worldwide	ED	Health systems need to be adaptable to changing contexts and strive to be environmentally sustainable	Making it easier to measure sustainability through increasing transparency in work processes	Financial challenges of healthcare costing more than expected, treating higher volumes of patients with more comorbidities and higher expectations of care, and workforce shortages	Digitisation to cut costs e.g., telemedicine to reduce travel time		
Crisp N. 2017	2017	United Kingdom	ED	Internal factors (1. efficiency & effectiveness of healthcare provision, 2. availability of well-trained health staff, 3. cost); external (4. population		Long term chronic conditions, especially the growing population of elderly with needs for community care		The need of the health and care system to be strengthened by support from communities and multi-sectorial partners	

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				health, 5. contribution of carers and informal networks of care, 6. integration of policies and practices), and overall (7. public and political acceptability and support)					
De Rosis S, Nuti S. 2018	2018	Italy	EM			Lack of a national or regional office responsible for project coordination. Longer-term financial investment is needed			
Delgado, P. 2016	2016	Canada	ED			Quality improvement collaborative systems did not			

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						improve the sustainability of participating health systems in the treatment and management of chronic diseases			
Dhalla I. 2007	2007	Canada	ED		The article speculates that it may be better to assess healthcare as a proportion of GDP rather than a proportion of Government spending	Politicians are recognising that the 'status quo' may not be sustainable due to system demands. This often assumes tax is static or declining, but this is open to debate and interpretation		Increasing spending on healthcare can occur as long as it does not impinge upon spending on non-health goods and services	
Dunn, P. M., B. B. Arnetz, J. F. Christensen, and L.	2007	United States of America	EM				Through a program in which leadership and physicians themselves recognised physician		

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Homer. 2007							wellbeing as important, and this well-being was measured		
Edwards, N., M. Rowan, P. Marck, and D. Grinspun. 2011	2011	Canada	RA			"Blockages" in the system e.g., power relationships, or unintentional blockages to innovation	Through the use of "leverage point" strategies such as structures by which to organise the system	Identified leverage points and blockages in macro- and micro-levels based on the literature review	
Ehrlich C, Kendall E. 2015	2015	Australia	EM			Participants identified that, should funding cease, the program would not be sustained. This was attributed to limitations in program planning			
Ellner, A. L., S. Stout, E. E. Sullivan, E. P.	2015	Worldwide	ED			Recognises a lack of traditional metrics to measure health system			

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Griffiths, A. Mountjoy, and R. S. Phillips. 2015						improvement or sustainability			
Farmanova E, Kirvan C, Verma J, et al. 2016	2016	Canada	EM			Lack of leadership support, difficulty creating partnerships, communicating with and engaging with staff and physicians, struggling with funding models that perpetuate working in silos, insufficient time and resources, difficulty obtaining data, data management	Start small, but think big; work toward incremental development; select a portfolio of projects that are manageable and align with Triple aim dimensions; include partners at the outset; strategize and build multidisciplinary teams and leverage existing capabilities; do not make assumptions		

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						and measurement, scoping improvement projects, ensuring sustainability	about patients/clients		
Fineberg HV. 2012	2012	United States of America	ED	Affordability (for individuals, organisations and the government), acceptability to key constituents, and adaptability			Increased use of IT, re-doubling the efforts to enhance quality and safety in medical care, improving healthcare of high-need patients in a way that prevents hospitalisations, honour patient preferences, rely on systems engineering and operations research to smooth the patient journey through the		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
							health system, learn from peers and from evidence, and champion a system that values accountability		
Foo, C. Y., K. K. Lim, S. Sivasampu, K. B. Dahian, and P. P. Goh. 2015.	2015	Malaysia	EM		Measurement using data envelopment analysis (DEA) overtime to measure efficiency				
Fox, L. A., K. E. Walsh, and E. G. Schainker. 2016	2016	United States of America	EM		Measured group sustainability through staff turnover rate				
Garde S, Hullin CM, Chen R, et al. 2007	2007	Worldwide	RA	Argues that linking the health system sustainability	There is a lack of qualitative indicators for sustainability. Suggestions of	There are technological (e.g., making programs that can be flexible			

Article demographics				*Reason for article inclusion and summary of results*					
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				and health information systems is important, but recognises that there is no suitable and all-encompassing definition of sustainability in relation to healthcare.	measuring sustainability by the eMergy (embodied energy) sustainability index	and adapt to context changes), socio-political and organizational (e.g., needing drivers behind interventions) issues/barriers			
Global, regional, and national disability-adjusted life-years (DALYs) 2017	2017	Worldwide	EM		Used information previously gathered to make decisions regarding healthy life expectancy and risk-adjusted life expectancy		Formulation of sustainable development goals (SDGs)		

Article demographics				*Reason for article inclusion and summary of results*					
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Greenhalgh, T., F. Macfarlane, C. Barton-Sweeney, and F. Woodard. 2012	2012	United Kingdom	ED		Case study: three-year follow-up of a healthcare program in London that underwent changes in terms of policy and economics		Some services changed over the three years and were altered relating to changes that happened with time e.g., national policy changes	Some interventions were sustained but looked different to the original intervention, due to it being adapted through the three years	
Gruen RL, Elliott JH, Nolan ML, Lawton PD, Parkhill A, McLaren CJ, Lavis JN. 2008	2008	Worldwide	RA	Sustainability after an initial implementation period when funding ceases is difficult				Targets of interventions to improve sustainability included the individual (e.g., through education), organisation (e.g., changes to policy), community (e.g., social actions) and system levels (e.g. social advocacy)	

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Guyon A, Hancock T, Kirk M, et al. 2017	2017	Canada	ED				Recognising the importance of governments and the health system providing fund and support for public health, as it delivers important information for the health system to thrive		
Heron, N. 2015	2015	North Ireland	EM				Measure the effect of an intervention for management of musculoskeletal complaints in GP		
Hibbert PD, Thomas MJW, Deakin A, et al. 2018	2018	Australia	EM			When there is an adverse event (AE) resulting in a root cause analysis (RCA), there are barely ever (5% of the time) provided strong	Observations and patient and carer interviews and review of notes may be useful in gaining a better understanding of adverse event situations		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
						recommendations for altering and improving the health system. 86% of the recommendations were considered 'weak'			
Hovenga EJ. 2013	2013	Worldwide	ED	Where everyone can access safe and correct health services to achieve the best outcomes possible			Four main outcomes or goals: improved health, responsiveness, financial risk protection, and improved efficiency	Information technology (IT) has a role to play in creating sustainable health systems (as it can lead to decisions having better clinical outcomes and lower costs)	
Inotai A, Petrova G, Vitezic D, Kalo Z. 2014	2014	Central-Eastern European Countries	ED	Focus on financial sustainability	Measure the potential innovation by new drugs in terms of		Goal of innovative pharmaceutical companies is to provide health gain, equity in		

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					monetary value		health, responsiveness of patients with complex comorbidities. To create this financial sustainability, affordable new innovative treatments and political sustainability are necessary		
Kepros JP, Opreanu RC. 2009	2009	United States of America	ED		Measuring the financial and social output of an organisation		Requires optimal relationships and synergy between the hospital, medical school and physicians, each with their own core competencies		
Kerr R, Hendrie DV. 2018	2018	Australia	EM	Two meanings: 1) financial sustainability for		To effectively fund patient access to hospital care in a system where			

Article demographics				*Reason for article inclusion and summary of results*					
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				governments and health services; 2) environmental sustainability		capital allocation is not funded based on patient-centredness			
Knutson, D. J. 1997	1997	United States of America	ED		The issue of measurement after the funding period was terminated	Limitations in current models of chronic illness management, and the difference between thinking about and the reality of how clinical work occurs	Recognises important components of models for critical care: should be patient centred, have a critical illness management model, be conscious of minimising patient out-of-pocket expenses, consulting with the organisation, and recognising the link between clinical and research outcomes		

Article demographics				*Reason for article inclusion and summary of results*					
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Lega, F., Prenestini, A., Spurgeon, P. 2013	2013	Worldwide	RA		Thirty-seven studies in a systematic review (both qualitive and quantitative were involved, and some had causal relationship analysis)	Rising costs, economic crises and ageing population	Recognise that the performance of healthcare organisations is correlated to management practices, leadership, engagement with professionals, management characteristics (e.g., training [doctors as managers are beneficial], background, career history), and organisational culture and management status. New technologies are also useful	Medical engagement is linked to better patient mortality rates, decreased serious incidents, maintains high levels of patient care	
Lehoux P, Williams-Jones B,	2008	Worldwide	ED	Recognising the importance					

Article demographics				*Reason for article inclusion and summary of results*					
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Miller F, Urbach D, Tailliez S. 2008				of being sustainable overtime, rather than creating for short-term gain					
L, Goeree R, Levine M, et al. 2011	2011	Canada	RA		When post-drug interventions are being used clinically, there should be field evaluation studies conducted to ensure the efficacy and cost effectiveness of the intervention		Coverage with evidence development (CED) is necessary, not to replace RCTs, but to gain the next level of knowledge about that intervention in clinical practice. It will also increase inter-disciplinary collaboration		
Levine, S., S. O'Mahony , A. Baron, A.	2017	United States of America	EM				Interventions to improve palliative care (PC) in paediatric hospitals, and to		

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Ansari, C. Deamant, J. Frader, I. Leyva, M. Marschke, and M. Preodor. 2017							improve physician self-care		
Lewis S. 2007	2007	Canada	ED			Financial, ageing population, concern over the proportion of government spending used on healthcare	The challenge of learning from other countries, and recognising the context specific elements of the systems they have enforced, and appropriately contextualising to the Canadian context e.g., Europe pays doctors less than Canada, utilises more home care	Believes sustainability should not be the focus, but rather quality improvement, aligning incentives with goals, making excellence mandatory and reducing health disparities should be the goal for at least the next five years	
Liaropoulos L,	2015	Worldwide	ED			Ageing population, the			It was suggest

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Goranitis I. 2015						financial stress placed on healthcare systems, and the question of who is to pay for this increased cost? (e.g., does retirement age remain the same or rise?)			ed that taxation should be a focus to contrib ute to healthc are
Lizarondo , L., C. Turnbull, T. Kroon, K. Grimmer, A. Bell, S. Kumar, M. McEvoy et al. 2016	2016	Australia	EM		Using survey of Scott's 10 strategies for sustaining change in the health system		Allied health respondents recognised that low- or no-impact interventions that cause little improvement or cause harm could be minimised, and by selecting care responses for comparative effectiveness		
Lozano I, Rondan J, Vegas JM,	2016	Spain	ED			Funding and support for ongoing professional			

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Segovia E. 2016						learning, recognising differences in health structures between countries to understand how recommendations are transferrable			
Mackenzie J. 2011	2011	United Kingdom	ED	Sustainable development meets the needs of the present whilst ensuring future needs can be met		The challenge of getting the balance between environmental, social and economic sustainability right, and considering how these factors interact	Need to take a systems view of managing system risk, ensuring a more sustainable business system, and being strategic in the long term rather than focusing on short term gains		
Magnan S, Fisher E, Kindig D, et al. 2012	2012	United States of America	ED			There are very few or no direct links between investing healthcare and establishing the social	The development of "health outcomes trust" organisations and accountable care organisations (ACOs) to work		

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						determinants of health, and there is little communication between stakeholders in these different camps. Rising healthcare costs are also a concern	to fulfil the triple aim and have sustainable funding. Community goal setting could also help to pay for population health		
McGorry PD, Hamilton MP. 2016	2016	Australia	ED			The challenges of implementing effective mental health reforms, including allowing access to early intervention with government funding, and funding with the NDIS for more complex cases	E-health giving the opportunity for a complementary role at all stages of illness, and the importance of research and evaluation in creating the most cost-effective solutions		
McGrath, S. P., and	2015	United Kingdom	EM		Dartmouth-Hitchcock		The define-measure-analyse-	The last phase, 'control'	

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G. T. Blike. 2015					Value Institute Experience		improve-control framework was developed to allow a problem-solving approach to challenges	promotes the changes to be sustained through time	
McIntosh E, Nagelkerk J, Vonderheid SC, Poole M, Dontje K, Pohl JM. 2003	2003	United States of America	ED			Recognition that nurse-managed centres often do not receive the necessary financial support for their centres to be continued	A financial advisory committee (FAC) could help improve financial outcomes in these centres	The FAC had meetings over three years and developed financial skills of the individuals	
McVeigh J, MacLachlan M, Gilmore B, et al. 2016	2016	Worldwide	RA, EM					Participation of people with disabilities (service users) in policy development and the governance of that service to improve sustainability. Additionally,	

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								aligning or integrating new models of care with existing models can strengthen program delivery and implementation of policies for rehabilitation. Support from professionals in the field and stakeholders is also beneficial for sustainability	
Molfenter, T., D. Gustafson, C. Kilo, A. Bhattacharya, and J. Olsson. 2005.	2005	United States of America	EM		Measure the self-reported and faculty-reported the success and sustenance of changes to their organisation	The model used was not able to predict sustainability of interventions or programs, but this may be due to the time period or the			

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						sustainability of the measure			
Nagle LM, Pitts BM. 2012	2012	Canada	ED				Recommendations: raise public awareness of services available, improve access to primary healthcare, empower patients about their care, use incentives to encourage serving in under-served areas, create an integrated health record service, devise alternatives to the fee-for-service model, increase funding for community services, give health professionals		

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							communication and language training, emphasise healthy lifestyles, ensure pharmaceuticals are affordable, decrease wait time and increase access for services for mental illness		
Pacifico Silva H, Lehoux P, Miller FA, Denis JL. 2018	2018	Worldwide	ED		Development of the responsible innovations for health (RIH) framework which identifies interventions that respond to the context and support equitable and sustainable	Ensuring Responsible Innovations in Health (RIH), involving consideration of sustainability and equity challenges			

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					health service. It includes 5 domains: 1. population health; 2. health system; 3. Economic; 4. organisational; and 5. environmental				
Pencheon D. 2013	2013	England	ED		Measuring preventable illness and unplanned hospital admissions as system failures until proven otherwise	Understanding the changing needs (demographic, social, cultural) of the changing population; understanding how the rapid growth of science and technology can change outcomes; the need for public	Utilising technology to promote sustainable and personalised healthcare, and improving the prevention of illness rather than treating the illness once it arises e.g., increasing physical activity		

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						services to act within environmental boundaries and increased levels of scrutiny			
Peric, N., M. M. Hofmarcher-Holzhacker, and J. Simon. 2017.	2017	European Union Countries	RA		Does not answer how we measure sustainability but the methods or 'actors and actions' by which sustainable health system performance is assessed				
Pronovost, P. J., C. G. Holzmueller, T. Callender, R. Demski, L.	2016	United States of America	ED		Measuring performance of the Johns Hopkins Hospital (JHH) over a number of years compared to		Phase 3 of the program involved a peer education program for health professionals		

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Winner, R. Day, J. M. Austin, S. M. Berenholtz, and M. R. Miller. 2016					national guidelines				
Rees, G. H. 2014.	2014	United States of America, United Kingdom, Australia	EM	"Implementation to effect continuous improvement, by either setting a cycle or programming for the next unit on the patient journey to undertake Lean activities"					
Robertson J, Walkom	2011	Australia	EM		Surveyed both GPs, specialists, and consumers	Both doctors and consumers recognise the rising cost of			

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EJ, Henry DA. 2011					(patients) in the health system, and asked them to identify the potential problems in the system	healthcare, but doctors are less concerned than consumers regarding the sustainability of the health system			
Robertson TM, Lofgren RP. 2015	2015	United States of America	ED			A large percentage (80%) of health spending is spent on a small proportion (20%) of the population due to complex episodes of care. The challenge is therefore to learn to address these in a more cost-effective manner, but this poses difficulties e.g., it is hard to		"The national health care agenda has been heavily influenced by the assumptions that disease prevention and the general promotion of "population health" will be sufficient to reduce health care spending to a sustainable level."	

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						decrease costs through conducting outpatient clinics			
Rosenberg-Yunger ZR, Daar AS, Singer PA, Martin DK. 2008	2008	Canada	ED	Sustainability of the health system "means ensuring that sufficient resources are available over the long term to provide timely access to quality services that address Canadians' evolving health needs."		The rising cost of pharmaceuticals and biopharmaceuticals, the complicated process by which drugs get approved for funding and use in developed countries, and the time-consuming alternatives (e.g., the Special Access Program in Canada). This leads to moral questions about the legitimacy	A mechanism to involve more stakeholders in the discussion		

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						and fairness of applying for drugs, especially new and expensive biopharmaceuticals			
Rosser, M. 2006	2006	Canada	ED				The Healthcare Materials Management Services (HMMS) created in 1997 and its success hinged on the collaboration between the hospitals involved	Sustaining change is thought to be attributed to executive funding, leadership, collaboration, openness of providers to the process, support of front-line clinical leaders, and development of a unique entity with its own culture	
Scheirer MA. 2005	2005	United States of America	RA	Sustaining a program or initiative that	Sustainability can fall into 3 measures: 1.	Challenge of funding only for short periods (3-		The authors suggest that the expectation that	

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				had previously been developed and maintained after the initial funding period or other impetus had ended	health benefits continue post-funding (individual level outcomes); 2. continuation of program activities post-intervention (organisation level outcomes); 3. relates to changes in community capacity to promote health post-intervention/funding (community level outcomes)	5 years) and the subsequent need to source funding. Also challenging is the uniqueness of context, whereby each project is influenced by its context and what programs or activities have preceded it		a new project will be sustainable after a 3-year funding project may be overly optimistic (therefore that it is hard to find funding opportunities after that time)	
Schwann, N. M., K. A. Bretz, S. Eid, T.	2011	United States of America	EM				Decrease hospital acquired infections through point-of-	Sustaining changes from an intervention	

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Burger, D. Fry, F. Ackler, P. Evans et al. 2011.							care electronic prompts (POCEPs)	over a two-year period	
Scott IA. 2006	2006	Australia	ED			Baby boomers getting older with comorbidities and decreased quality of life, the 'worried well', new technologies, the demand for new and further treatments, the influence of the media (e.g., "miracle cures"), juggling a finite health budget, threats of global warming, and deciding which treatments	Training patients with counselling and behavioural strategies to take more control over their own care, encouraging non-traditional caregivers to do some forms of care if found to be equally effective	Abolishing state and federal boundaries in funding and creating a new federal system, having each patient with a GP responsible for their care, linking healthcare databases with a unique patient identifier	

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						should be subsidised			
Sepehri A, Chernomas R. 2004	2004	Canada	ED	Acknowledges that different fields have different definitions of sustainability, and that these definitions tend to focus on resources and the capacity of the public sector to finance current and future health expenditure	Fiscal sustainability has been measured through the percentage of provincial and territorial budget allocation for healthcare, but this acts on two assumptions. 1) providers are assumed to respond to needs, and 2) the needs are assumed to reflect the current state of medical knowledge	Threat to sustainability is the uncertainty of government funding			

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Shaw J, Wong I, Griffin B, Robertson M, Bhatia RS. 2017	2017	Canada	EM			"Increasingly complex patient population"	Emphasis must be placed on sustainability in order to protect the universal public healthcare system. "Need for comprehensive health system planning"		
Shigayeva A, Coker RJ. 2015	2015	Worldwide	ED	Sustainability is the system's resilience. From a public health perspective, sustainability is defined in relation to whether the benefit to stakeholders is sustained overtime. Financial sustainability and being	Several frameworks have been suggested, which measure determinants or dimensions of sustainability. They mostly do not consider efficiency, which is an important component of sustainability. Underrepresen		Five programmatic components in disease control programs that are important for sustainability: leadership, capacity, interactions (notions of integration), flexibility/adaptability and performance		

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				responsive to the consumer wishes are also important	ted field: of 108 studies in systematic review, only two looked at SPHS (Lafond 1995a; Pammolli et al.)				
Solon, O., K. Woo, S. A. Quimbo, R. Shimkhada, J. Florentino, and J. W. Peabody. 2009.	2009	Philippines	EM		Developed Q* to measure quality of hospital performance across a range of facilities				
Sonnenreich P, Geisler L. 2016	2016	United States of America	ED		Financial issues of rising healthcare costs and decreasing affordability	Financial unsustainability in the system, (e.g., that 30% of healthcare spending is wasteful) and	The initiation of a value-based formulary in pharmacies		

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						trying to balance this with allowing patients to access new expensive medicines. But a new way to look at it would be to analyse the *value* of the drug. There is also a problem with patient adherence to medications, especially when they have a higher expense			
Stockdale, S. E., J. Zuchowski, L. V. Rubenstein, N. Sapir, E. M. Yano, L.	2018	United States of America	EM		Through interview analysis	Barriers to sustained improvement included a lack of collaborative working between local practice leaders; another	Through the introduction of quality care councils and an evidence-based quality-improvement project aimed at improving	Assessed project completion and spread and found it was important to have mechanisms by which to hold	

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Altman, J. J. Fickel, S. McDougall, T. Dresselhaus, and A. B. Hamilton. 2016						challenge is balancing time that could be spent on patients to be attributed to the 'extra work' of the project	disciplinary leadership, aligning frontline improvement innovation and assessing implementation designs	frontline innovations would be suitable for spread (but does not research the impact of this)	
Stoelwinder JU, Paolucci F. 2009	2009	Netherlands	ED			Growth rate of the Australian health system is financially unsustainable, with the Australian Medical Association, as well as state governments, lobbying for more funding. It is also likely that there will be significant resistance by stakeholders	Being inspired by the Netherlands new system of health reform, including policy objectives of durability (sustainability), solidarity (equity), choice, quality and efficiency. Additionally, there are tools to keep citizens engaged in their healthcare decisions,		

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						when there is suggestion of Australian health system reform	including the choice of 15 health insurance providers. To avoid insurers seeking out low-risk clients, there has been a complex risk-equalisation scheme put in place		
Stoelwinder JU. 2009	2009	Australia	ED			The need to address both financial and political sustainability in the health system (e.g., with rising healthcare costs, and the political structures to deal with tax payment rather than consumer payment for the health system)	Governance needs to be established for the "healthy Australia accord", the federal government should progressively take over funding responsibilities for Medicare, and a funding model called "Medicare select" should be		

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							established whereby public and private health models compete to allow consumer choice		
Stuart N, Adams J. 2007	2007	Canada	ED		Cost of healthcare that outpaces economic growth, and a way of conceptualising this is in a comparison to Maslow's hierarchy of needs, with different levels of health need (but this adds to questions of how health need and benefit are defined)	Spending on healthcare is being pushed to unsustainable levels meaning that, in order to be sustained, spending must be taken away from other areas e.g., education, infrastructure; or increase revenue; or decrease cost of healthcare			
Taylor M. 2007	2007	Australia	ED				The expansion and development		

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							of the role of nurse practitioners (NPs) e.g. By improving access to healthcare in remote and rural Australia		
Thompson RE. 1998	1998	United States of America	ED	Sustainability defined as meeting the needs of the present whilst guarding resources for future generations		Financial and moral factors that influence physician decisions, which have ultimately been influenced by politics and laws		"Managed care" needs to mature and evolve through supporting teaching, research, patient care and care for their staff	
Tricco, A. C., H. M. Ashoor, R. Cardoso, H. MacDonald, E. Cogo, M. Kastner,	2016	Canada	RA		Scoping review to see what knowledge could be gained from studies aiming to use knowledge translation to			Specifically examined articles that had follow-up one or more years after the initial test, or continued beyond the funding period	

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L. Perrier, A. McKibbon, J. M. Grimshaw, and S. E. Straus. 2016.					improve health of patients managing chronic diseases				
Tsasis P. 2009	2009	Canada	ED				The potential of improving access to home care for older patients with one or more chronic illnesses, through improving funding for these programs. Additionally, interdisciplinary teamwork and having a patient-centred approach to care has the potential to improve health system sustainability by		

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							minimising drug interactions and conflicting advice given to patients		
Van de Pas R, Hill PS, Hammonds R, et al. 2017	2017	Worldwide	ED			The current sustainable development goals (SDGs) are superficial, and more political debate on structure, policy and agency are needed to bridge the gap and overcome existing health injustices. Also noted that many of the SDGs, although not specifically health related, have impacts on health		Stewardship embodying the establishment of norms, values and rules to guide policy development and advocacy for global health across sectors. Also recognised as important is the production of global public goods, the mobilization of global solidarity and the management of externalities e.g., governments, states or	

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								transnational bodies	
Veillard J, Denny K. 2014	2014	Canada	ED			The majority of healthcare spending is on a small proportion of patients	Need for more consistency in practice and delivery methods		
Wakerman J, Humphreys JS. 2011	2011	Australia	RA			Addressing rural and remote areas in Australia. These areas are known for their deficits e.g., high morbidity and mortality, workplace shortages, lack of services and high cost of care delivery. Systems need to realise there is no one-size-fits-all solution, and changes need to align the on the	A systematic approach is needed to improve primary healthcare		

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						micro-scale health service level as well as the macro-scale external policy environment			
Wakerman J, Humphreys JS. 2013	2013	Australia	ED			Tension between national health workforce policy initiatives and demographic, socioeconomic and political forces. Overall, healthcare service access and the health status are worse in non-metropolitan areas	The aim is to provide accessible, affordable, appropriate healthcare regardless of geography. Potential improvement in the number of doctors in regional and rural areas if there is a change in the culture of thinking of rural areas as negative, and through the increased number of medical students being		

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							trained appropriately for regional and remote work, and addressing the other workforces that collaborate with the rural services (e.g., funding, infrastructure, governance), and increasing the accountability of the health service through agreed indicators and output measures		
Woodward, G. L., A. Iverson, R. Harvey, and P. G. Blake. 2015	2015	Canada	ED			Recognises the challenge of bridging policy and practice		Requires leadership, transparency, accountability and communication	

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Wutzke, S., M. Benton, and R. Verma. 2016	2016	Australia and New Zealand	EM					Four general factors were found to be present in successful interventions: 1. having a sound business case for change; 2. being prepared for the change process and adapting to different contexts; 3. promoting change through stakeholders; 4. ensuring support through the implementation process	
Zhao Y, Russell DJ, Guthridge	2017	Australia	EM		Regression analyses of payroll data	Managing fluctuations in funding and the translation of this to staff			

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S, et al. 2017									
Pisco L, Pinto LF. 2020	2020	Portugal	ED			Comorbidity and increasing age	Suggests that primary healthcare and preventive care (e.g., maternal health, disease prevention, vaccines etc.) is a strong investment to increase productivity and strengthen social cohesion		
Ganann R, Peacock S, Garnett A, et al. 2019.	2019	Canada	ED			Discusses how an ageing population presses the need for sustainable healthcare system.	Capacity building through health services and policy research training in the following competencies: understanding health systems and the policy-making process, integrated knowledge		

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							transition activities tailored to the specific needs of primary healthcare clinicians and policy making, networking, negotiation an dialogue, project management, interdisciplinary collaborations among patients researchers health practitioners and policy makers, change management implementation, leadership mentorships and collaboration, analysis and evaluation of health related policies and programs,		

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							ensuring capacity for meaningful patient engagement, mobilising existing expertise, support careers, building capacity to apply research to real-world problems.		
Jessup RL, O'Connor DA, Putrik P, et al. 2019.	2018	Global	ED			Increasing pressures from ageing population, increasingly prevalent chronic disease, higher cost of tests, workforce shortages.			
Vainieri M, Noto G, Ferre F, Rosella LC. 2020.	2020	Global	ED	Defines sustainability as the ability of a health system to meet the	broadly discusses how performance monitoring or measurement isn't currently	Overall short-term bias and perspective of the health system impacts establishing	Challenges listed include the need for improvement in data collection management, the need to adopt a patient-based		

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				needs of present and future.	sensitive enough to monitor health system sustainability	health system sustainability	perspective, and how performance measures are used in practice.		
Lo Sardo DR, Thurner S, Sorger J, Duftschmid G, Endel G, Klimek P. 2019.	2019	Austria	EM		Measures resilience, however, the paper argues that to be sustainable health systems must be resilient	Rising costs, chronic conditions, and ageing	To counter unsustainability health systems must be resilient		
Williams I, Allen K, Plahe G.2019.	2019	England	EM		Rationing of finances and how this occurs in reality, with reference to the 'seven forms of rationing' (and how this can be applied to see if health	Recognition that there are perceived barriers to timely release of central funding, and the need to prioritise spending			

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					systems are sustainable) - e.g., dilution via spreading thin of resources				
Ammentorp J, Bigi S, Silverman J, et al. 2021.	2021	Australia, Ireland, Austria, Denmark	EM			Challenges to implementing programs: convincing investors, involving stakeholders, locating change agents	Communication training programs à improving competencies and knowledge related to patient centred care		
Braithwaite J, Mannion R, Matsuyama Y, et al. 2018.	2018	Global	ED			Common pressures or stressors are manifesting in every healthcare system; these include scarcity of financial and staff resources, expectations of the public, and maintaining healthy			

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						relationships with multiple stakeholders			
Buttigieg SC. 2019.	2019	Global	ED	Sustainability in healthcare defined as "key task for health policy-makers to withstand social, financial, and ecological pressures and challenges"		Challenges discussed include service delivery, human resources, leadership and governance	"Among these include an open innovation strategy that redesigns sharing intellectual property, resources, and data – and therefore introducing flexibility, easier accessibility to libraries and collections of molecular entities, as well as opportunities for external researchers to work alongside company scientists."		
Byskov J, Maluka S,	2019	Global	RA					"The debate on defining and	

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Marchal B, et al. 2019.								operationalizing more sustainable systems approaches by more strongly including a priority setting and a decision-making process guidance raises the question whether (1) technical evidence-based information is most important and can be improved by more participatory value and specific context-based approaches (Baltussen et al., 2013) or (2) the participatory democratically	

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								based approaches (Biehl and Petryna, 2013; Daniels et al., 2015) are most important, but need support from technical evidence.”	
O'Brien N, Li R, Isaranuwatchai W, et al. 2019	2019	Global	ED			Paper looking at HTA as a means of improving HSS. Cites confusion over definition of HTA as a barrier to its implementation	"Health technology assessment (HTA) is a multi-disciplinary exercise for assessing the clinical and cost-effectiveness of technologies in the form mainly of programs of health (and sometimes social) care, together with their associated structural,		

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							procedural and implementation arrangements". Governments consequently need to take responsibility for the development of strong and sustainable health systems		
Hanney S, Kanya L, Pokhrel S, Jones T, Boaz A. 2020.	2020	Global	RA			Research funding is a major barrier to HS research and therefore health systems cannot be improved. Discusses waste in research and fragmentation	"WHO Health Evidence Network Synthesis Reports. What is the evidence on policies, interventions and tools for establishing and/or strengthening national health research systems and their effectiveness? Copenhagen:		

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							WHO Regional Office for Europe"		
Bentley C, Peacock S, Abelson J, et al. 2019.	2019	Canada	EM			Expensive cancer treatment.	The paper calls to use cost effective decisions and involve patients when making cancer funding decisions. Also, to disinvestment if that treatment becomes less effective later		
Braithwaite J, Vincent C, Nicklin W, Amalberti R. 2019.	2019	Global	ED				We will need to reflect a reasons health journey overall in evaluations and treatment		
Braithwaite J, Zurynski Y, Ludlow K, Holt J, Augustsso	2019	Global	EM protocol	Defines fiscal sustainability, equality					

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n H, Campbell M. 2019.									
Rudnicka E, Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. 2020.	2020	Global	ED				An ageing population	establishing a platform of innovation and change, support country planning and action, collect better global data on health ageing, promoting research that addresses the current and future needs of older people, aligning health systems to the needs of older people, laying the foundations for a long-term care system in every country, Ensuring the	

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								human resources necessary for integrated care, undertaking a global campaign to combat ageism, defining an economic case for investment, Enhancing the global network for age-friendly cities and communities.	
Shen H, Sui Y, Fu Y. 2020.	2020	Global	EM		This paper looks at apply social choice theory and the Stochastic Multicriteria Acceptability Analysis for group decision making (SMAA-2) to				

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					measure the value of health systems. The measurement consistent of three metrics; access, satisfaction, and efficiency, and considers individual preference to each. The article suggested that measuring value is the ultimate goal of modern healthcare and can assist in building sustainable health systems				

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Fridell M, Edwin S, von Schreeb J, Saulnier DD. 2020.	2020	Global	RA				Implies that resilience is essential to a sustainable healthcare system. Common factors contributing to resilience included: financing, highly skilled workforce, continuous collection of information at the population level, leadership and governance,		

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							medical products (such as vaccines and affordable medications), and service delivery.		
Walsh K. 2019.	2019	Global	ED			Limited budget: "Health systems strengthening is a challenge – how can we improve access, coverage, quality and efficiency, and still keep within a limited budget?"	Developing human resource potential through e-learning	Broadening e-learning through online simulations, build on access (e.g., expand to mobile devices and apps)	
De Santis M. 2019.	2019	Global	RA			Change is expensive and incremental, integrated care is hard to quantify	Suggests that integrated care is a solution to system fragmentation, efficiency, and high costs in chronic disease and rare diseases	To achieve and scale integrated care there must be political support and commitment, strong governance, stakeholder engagement, organisational	

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								change, leadership, workforce education and training, patient focus/empowerment, financing incentives, ICT infrastructure and solutions, monitoring/evaluation system	
Ferrelli RM, Fantini B, Taruscio D. 2019.	2019	European Union	ED			Affordability and financing of equal access and healthcare delivery for people with rare diseases	Discusses networking or rare diseases providers to improve knowledge and healthcare delivery in the EU. The paper also suggests that resilience is important to sustainability	Discusses levers about to build a sustainable health system for rare diseases. Levers include organisation structure, partnerships, workforce, knowledge development, leadership and governance, and country specific context.	

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Steenhuis S, Struijs J, Koolman X, Ket J, E VDH. 2020.	2020	Global	RA			Discusses challenges in implementing and changing payment methods to address health system sustainability	"Our study shows that bundled payment contracts affect a broad range of health system actors, so their design and implementation should not be approached as merely the introduction of a new contracting model, but as part of a broader transformation to a more sustainable, value-based health care system. This approach should not focus on the volume and price of separate health care products but on the full care		

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							cycle of patients and the integral costs and outcomes associated with it"		
Nikolić B. 2020.	2020	European Union	ED			Discusses the fiscal sustainability of health systems, how spending has outpaced GDP and uses Baumols theory and the human factor in healthcare (that much of it cannot be automated) causing costs to rise.	This paper focuses on market competition and competition law between providers and how this could improve costs	This paper discusses how healthcare providers can be considered undertakings through international case law and through guidelines e.g., separation of each activity performed, separation of management activities and calculate the economic nature of each of service item.	

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Niraula S. 2019	2019	Canada	ED			Discusses how cancer medication funding is at odds, and needs to be balanced against, the fiscal sustainability of the healthcare system in Canada. A challenge in this sector is that cancer drugs are expensive	To address the high cost and maintain fiscal sustainability the authors suggest to: improve collaborations and decrease duplication of efforts in R&D, minimise the conflicts of interest among members, involve citizens into decision making process, reconsider the funding model to an outcomes based funding model, incentivise cheaper alternatives (generic drugs) and penalise branded ones.		

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Pereno A, Eriksson D. 2020.	2020	Nordic Countries	EM and RA	"In spite of the different ways to define sustainable healthcare systems, and regardless of whether the three-pillar model or the integrated understanding of sustainability is applied, all approaches seem to have in common that a comprehensive approach with a long-		In the introduction the paper mentions rising costs, chronic disease, societal pressure such as informed and sometimes demanding patients			

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				term focus and a need to balance economic, social, and ecological interests needs to be used in the discussion of sustainable healthcare systems."					
Bogaert P, van Oers H, Van Oyen H. 2018.	2018	European Union	EM and RA		By developing a sustainable health information infrastructure for monitoring performance		A unified information system with clear governance, central coordination and distributed implementation across EU countries will support system performance - provide unified data	Vague - it talks mainly about the structure of the information systems	

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Wurcel V, Cicchetti A, Garrison L, et al. 2019.	2019	Global	ED			financial implications of value of diagnostic information (VODI), including supporting cost containment, allowing timely interventions and preventing disease progression and long-term cost. This requires rapid technological pathology testing and turnaround times to allow rapid clinical decisions (e.g., point-of-care testing, e-health records)	the need to identify and leverage the benefits of the value of diagnostic information for health systems		

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Cunningham FC, Ranmuthugala G, Westbrook JI, Braithwaite J. 2019	2019	Australia	ED		Via the framework/network.				
Embi PJ, Richesson R, Tenenbaum J, et al. 2019	2019	USA	ED	Learning health system			the research results should extend far beyond the awardees who conduct the research, and there should be collaboration between funding agencies	that federal funding agencies should see investment in an initiative as an ongoing strategic investment rather than a time-limited option	
Enticott J, Braaf S, Johnson A, Jones A, Teede HJ. 2020.	2020	Australia	EM	Links to a learning health system relying on continuously learning		challenge of engaging multiple stakeholders in governance, research and within the health system itself; having	creating a vibrant learning culture with top down and bottom-up support; clinician engagement and inclusion; transparency around patient	importance of consistent investment/funding overtime	

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						leadership with focus, vision and engagement; skilled workforce and capacity building; data access and sharing/collaborating with consent	data use and research		
Park YL, Canaway R. 2019.	2019	WHO Western Pacific Region	ED	"Healthcare system sustainability and resilience relate to preparedness and capacity to cope in the face of disease outbreak or disaster."			Move towards universal healthcare which will enable "quality; efficiency; equity; accountability; and sustainability and resilience"	Well-established care Utilising traditional medicine	

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Quaglio G, Figueras J, Mantoan D, et al. 2018.	2018	Italy/ Belgium	ED			Y "Over the last 2 decades, health systems in the European Union (EU) are being questioned over their effectiveness and sustainability. In pursuing both goals, they have to conciliate coexisting, not always aligned, realities. For example, (i) an epidemiological transition where chronic conditions and complex patients require	Y - "(i) community participation is a key principle of health promotion practices, stemming from an ideological position that shifts from a bio-medical paradigm towards a social model that creates conditions where people are active participants in their own healthcare;16 (ii) strengthening primary care is one of the major challenges facing EU		

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						integrated services pivoting around primary care, that contrasts with the prevalence of specialized, rather fragmented care, mainly provided by hospitals;1,2 (ii) a pervasive idea that more care is always better than less care, when there is a widespread evidence of inappropriate use of treatments and technologies;3 (iii) the rising promise of	healthcare systems as they reduce fragmentation in care provision. Decision makers are searching for models that are able to increase the whole pathway of care: primary, secondary and tertiary, long-term care and eventually social care;17 (iii) threats to good governance—lack of appropriate competences, the existence of conflicts of interest, bureaucratic rigidity—translate into a		

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						personalized medicine, that eclipses the efforts in promoting healthy lifestyles;4 or (iv) the increasing demand of information and transparency with respect to services' quality and safety, that contrasts with serious flaws in the good governance of health services.5 Underlying these challenges is a profound transition in	lack of transparency, poorly thought-out policies and the prevailing use of the 'low-hanging fruit' strategy;18 and (iv) finally, the generation and reuse of health data (administrative, clinical, environmental, etc.) are essential in embracing the change in the knowledge paradigm towards learning health systems and subsequently toward more sustainable health systems"		

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						the medical knowledge paradigm, from the traditional and prevailing heuristic approach to the development of data-driven learning systems."			
Kilbourne AM, Braganza MZ, Bowersox NW, et al. 2019.	2019	USA	EM			Funding, lack of incentives for researchers to apply their research into practice		Discusses how the learning health system may contribute to incremental change and enhancement of health system performance.	
Lehoux P, Roncarolo F, Silva HP, Boivin A, Denis JL,	2019	Global	RA			"Since the late 1980s, new health technologies not only	Successful health systems are characterized by healthy people, superior care and fairness. The		

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Hebert R. 2019.						increased global inequalities, but they also undermined the sustainability of health systems in rich and poor countries alike. "	researchers write that "over the next decades it will be imperative to implement policy mechanisms that can support the development, financing and use of innovations that do not compromise but rather contribute to the success and sustainability of health systems."		
Editorial. Healthcare quarterly (Toronto, Ont.). 2020;22(4)	2020	Canada	ED	Health systems need the right distribution of educated health professionals who have the right	Yes	Yes	Yes	Yes	

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				training and mindset; the skills and support to build effective teams and visionary leaders who co-create compassionate cultures and inclusive partnerships that foster integrated patient-centred care; and the right resources, processes, and tools to deliver solutions for current					

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				and future demands.					
Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study	2020	Global	EM		Measures of UHC; UHC viewed as way of achieving health system sustainability and sustainable health outcomes.	Talks about challenges in achieving UHC- especially for low-income countries - identifies per-capita spending to be able to reach 90% UHC as $2538…Also identifies USA as outlier - achieves only 82% overall coverage despite spending ~8500 per capita			

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2019. Lancet (London,									
Abimbola S, Baatiema L, Bigdeli M. 2019.	2019	Global	RA	Talks about resilient structures and Financing models		Talks about the challenges of decentralisation - i.e., Decentralised governance and financing to jurisdictions and the impacts of this model. Australian specific			
Barbazza E, Kringos D, Kruse I, Klazinga NS, Tello JE. 2019.	2019	Global	EM & RA	Provides a definition of a sustainable primary care system that is linked with the broader health system	Provides a framework "The resulting framework applies a performance continuum in the classical approach of structures-processes-outcomes	Lack of standardised data collection; poor linkage of primary care with broader system			

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					spanning 6 domains – primary care structures, model of primary care, care contact, primary care outputs, health system outcomes, and health outcomes – that are further classified by 26 subdomains and 63 features of primary care."				
Craig N, Robinson M. 2019.	2019	Scotland	ED	Yes		Yes		Yes	
Costa-Font J,	2020	Global	ED	This perspective paper	Mainly in terms of	Focuses on ageing and increasing	Prevention	Yes	

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Levaggi R. 2020.				argues that a sustainable health system design encompasses identifying opportunities and incentives for innovation, alongside an analysis of its effect on expenditure. Although aging alone is not a powerful cost driver, the combined effect of costly	economic outcomes	demands for new medical technologies including new treatments but talks about the potential impact of prevention			

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				innovation, personalized care, and the rise of chronic conditions is. We identify an increasing role of prevention, the reduction of the prevalence of chronic conditions, re-organisation of incentives in healthcare markets, including a closer scrutiny of the					

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				appropriate ness of new treatments					
Derakhsh ani N, Doshman gir L, Ahmadi A, Fakhri A, Sadeghi-Bazargani H, Gordeev VS. 2020.	2020	Global	RA	UHC is implied to be a sustainable health system	Focussed on UHC as a goal for sustainability ; uses a framework and several dimensions… Talks about determinants, barriers and enablers of sustainable UHC	Service delivery (dimension 5) is another dimension of the suggested tool with four axes: basic benefits package, geographical access, quality of care, and human resources for health. In regards to the benefits package axes, developing an affordable, sustainable, and equitable basic package of healthcare that	Yes - talks about culture, integration, seamless care. Diffusion of Excellence practices in making a difference every day for veterans, this article highlights 4 different practice areas	Yes - Social infrastructure and social sustainability (dimensions 1–2) seem to be influential factors in progress towards UHC: society literacy, community income, poverty, age group, and population.54 To reach social sustainability and providing social infrastructure, as well as providing sustainable development,	

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Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
						can serve various population needs is a challenge.		political will and determination, technical skills, expertise, and administrative cooperation are required. Political commitment can be a pivotal issue in progress to achieve UHC. Socio-political and economic sustainability essential to support a sustainable UHC	
Clancy C. 2019.	2019	USA	ED	Not as such… indirect	talks about data to support innovation and measure success		Yes - talks about culture, integration, seamless care. Diffusion of Excellence practices in making a	large national network providing care to 9 million veterans; Importance of systems and data. The next	

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
							difference every day for veterans, this article highlights 4 different practice areas: 1) direct scheduling, 2) access to healthcare in rural areas, 3) access to mental healthcare, and 4) interactive and patient-centred care.	challenge, however, is elevating such lessons learned to transition the initiative from a nascent start-up to a sustainable part of VHA's culture. There are 3 primary components of the current transition plan: 1) cultivate the culture, 2) build partnerships and encourage collaboration, and 3) embrace appropriate technology.	
Marcotte LM, Moriates C, Wolfson DB,	2020	USA	ED	indirectly describes sustainability through high value care,			Yes - supporting professionalism is seen a more durable intervention rather than	"Medical professionalism is a strong, durable, intrinsic motivator for	

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Frankel RM. 2020.				professionalism and education and appropriate incentives and remuneration; It talks about re-conceptualising high value in terms of "infusing" this concept as a principle for practice among all doctors in training... Providing high-value care as a competency for doctors in training			dealing with incentives for single aspects of practice. Linking professionalism with payment reform	improving value in healthcare delivery and should be employed to support training efforts, systems change and payment reform".	

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Witter S, Palmer N, Balabanova D, et al. 2019.	2019	Global	RA	The term "HSS" first came from a recognition of the need to address the distorting effects of increasing expenditure on vertical programmes targeted to address specific diseases and interventions (e.g., HIV/AIDS, polio) in the absence of support to broader systems, while recognising that without					

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
				strengthening of basic health systems, vertical programmes would be unlikely to deliver as expected.					
Sturmberg JP. 2018	2018		ED				Could work to improve the resilience of patients with multi-morbidities. This has been shown to help prevent overutilization on the health system, as well as improve the QOL of patients		
Thistlethwaite JE, Dunston R,	2019	Australia	ED		Recognise that interprofessional health education		The importance and shift of interprofessional education from an organisational		

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
Yassine T. 2019.					needs to be funded constantly (even if funding is relatively small) and that it needs to be able to be adapted to micro, meso and macro processes		to a national level, and the role of national funding		
Iskrov G, Stefanov R, Ferrelli RM. 2019.	2019	European Union	ED		Recognition that fiscal sustainability is important, and that achieving this means that more prevalent diseases get more funding	The challenge of making primary care accessible, affordable, and reducing unnecessary hospital admissions. Integrating the health workforce to the benefit of the patient. Anticipating for			

Article demographics				*Reason for article inclusion and summary of results*					
Reference	**Year**	**Country**	**Type ***	**1. Definition of SPHS**	**2. Measuring SPHS**	**3. Challenges to SPHS**	**4. Improvements to SPHS**	**5. Sustaining or scaling change for SPHS**	**6. Other**
						changes in need and changing the health workforce accordingly. And that constant data collection and analysis could improve policy and practice			

*Note.
ED – editorial, opinion piece; RA – review article, EM – empirical article.

HOW CAN THE HEALTHCARE SYSTEM DELIVER SUSTAINABLE PERFORMANCE? A SCOPING REVIEW

ADDITIONAL FILE 3: QUALITY ASSESSMENT

Hawker rating for included empirical articles

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
Ament SMC, Gillissen F, Moser A, Maessen JMC, Dirksen CD, von Meyenfeldt MF, et al. 2014	4	4	4	3	4	4	4	3	3	33
Bramesfeld, A., F. Amaddeo, J. Caldas-de-Almeida, G. Cardoso, A. Depaigne-Loth, R. Derenne, V. Donisi et al. 2016	4	4	3	3	4	1	4	3	4	30

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
Buttigieg SC, Schuetz M, Bezzina F. 2016	3	3	4	3	3	4	4	3	4	31
Buykx P, Humphreys JS, Tham R, et al. 2012	4	4	2	1	1	3	4	2	4	25
Cho CC, Ramanan RA, Feldman MD. 2011	4	3	4	4	4	1	4	3	4	31
De Rosis S, Nuti S. 2018	3	4	4	3	4	1	4	3	3	29
Dunn, P. M., B. B. Arnetz, J. F. Christensen, and L. Homer. 2007	3	4	4	4	4	1	4	3	3	30
Ehrlich C, Kendall E. 2015	4	3	4	3	3	3	4	3	3	30
Farmanova E, Kirvan C, Verma J, et al. 2016	4	3	3	2	3	1	4	2	4	26
Foo, C. Y., K. K. Lim, S. Sivasampu, K.	4	4	3	2	4	2	4	3	3	29

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
B. Dahian, and P. P. Goh. 2015										
Fox, L. A., K. E. Walsh, and E. G. Schainker. 2016	4	4	4	1	4	1	4	2	3	27
Garde S, Hullin CM, Chen R, et al. 2007;129(Pt 2):1179-1183.	3	4	3	4	4	1	3	2	3	27
Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. 2016	4	4	4	3	4	3	4	4	4	34

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
Heron, N. 2015.	3	3	4	4	4	1	4	4	2	29
Hibbert PD, Thomas MJW, Deakin A, et al. 2018	4	4	3	3	4	3	4	3	4	32
Kerr R, Hendrie DV. 2018	4	4	4	3	4	3	4	3	4	33
Levine, S., S. O'Mahony, A. Baron, A. Ansari, C. Deamant, J. Frader, I. Leyva, M. Marschke, and M. Preodor. 2017	4	3	4	3	4	1	4	3	4	30
Lizarondo, L., C. Turnbull, T. Kroon, K. Grimmer, A. Bell, S. Kumar, M. McEvoy et al. 2016	4	4	4	3	4	3	3	3	4	32
McVeigh J, MacLachlan M, Gilmore B, et	4	3	3	3	4	4	4	3	3	31

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
al. 2016;12(1):49.										
McGrath, S. P., and G. T. Blike. 2015	4	4	4	3	3	1	4	1	2	26
Molfenter, T., D. Gustafson, C. Kilo, A. Bhattacharya, and J. Olsson. 2005	2	2	4	2	4	3	3	3	4	27
Rees, G. H. 2014	3	4	3	3	4	1	4	3	4	29
Robertson J, Walkom EJ, Henry DA. 2011	4	4	4	3	4	4	4	3	3	33
Scheirer MA. Is sustainability possible? A review and commentary on empirical studies of program sustainability. Am J Eval.	3	2	3	3	4	4	2	2	4	27

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
2005;26(3):320–47.										
Schwann, N. M., K. A. Bretz, S. Eid, T. Burger, D. Fry, F. Ackler, P. Evans et al. 2011	4	2	4	2	4	3	3	2	3	27
Shaw J, Wong I, Griffin B, Robertson M, Bhatia RS. 2017	3	4	4	2	4	1	4	3	3	28
Solon, O., K. Woo, S. A. Quimbo, R. Shimkhada, J. Florentino, and J. W. Peabody. 2009	4	4	4	3	4	3	4	3	4	33
Stockdale, S. E., J. Zuchowski, L. V. Rubenstein, N. Sapir, E. M. Yano, L. Altman, J. J. Fickel, S.	4	4	4	3	4	1	4	3	4	31

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
McDougall, T. Dresselhaus, and A. B. Hamilton. 2016										
Wutzke, S., M. Benton, and R. Verma. 2016	4	4	4	3	4	4	4	3	3	33
Zhao Y, Russell DJ, Guthridge S, et al. 2017	4	4	4	3	4	3	4	3	4	33
Lo Sardo DR, Thurner S, Sorger J, Duftschmid G, Endel G, Klimek P. 2019.	3	3	2	1	4	1	4	3	3	24
Williams I, Allen K, Plahe G. 2019.	3	4	4	4	4	4	4	4	4	35
Ammentorp J, Bigi S, Silverman J, et al. 2021.	4	4	3	3	4	3	4	4	4	33
Bentley C, Peacock S, Abelson J, et al. 2019.	4	4	3	3	3	3	4	4	4	32

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
Shen H, Sui Y, Fu Y. 2020.	4	4	2	2	4	4	4	4	4	32
Fridell M, Edwin S, von Schreeb J, Saulnier DD. 2020.	4	4	3	3	4	4	4	4	4	34
Pereno A, Eriksson D. 2020.	3	4	3	3	4	3	4	4	4	32
Bogaert P, van Oers H, Van Oyen H. 2018.	4	4	4	3	3	3	4	4	4	33
Enticott J, Braaf S, Johnson A, Jones A, Teede HJ. 2020.	4	4	4	3	4	4	4	3	4	34
Kilbourne AM, Braganza MZ, Bowersox NW, et al. 2019.	4	3	3	3	4	2	3	4	4	30
Measuring universal health coverage based on an index of effective coverage of health services	4	4	4	4	4	3	4	4	4	35

Reference	Abstract and title	Introduction and aims	Method and data	Sampling	Data analysis	Ethics and bias	Finding and results	Transferability and generalisability	Implications and usefulness	Total (out of 36)
in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020.										
Barbazza E, Kringos D, Kruse I, Klazinga NS, Tello JE. 2019.	4	4	4	4	4	3	4	3	3	33

Note.
Each category is rated on a 4-point scale (from 1="very poor" to 4="good") to create a total score of up to 36.

AACODS rating for editorial and opinion articles

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Al Dhawi AA, West DJ, Jr., Spinelli RJ, Gompf TA. The challenge of sustaining health care in Oman. *Health Care Manager*. 2007;26(1): 19-30.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, peer reviewed	Yes	Focus on Oman	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article in recognising threats to the health system in Oman, and a model for sustaining healthcare reform in Oman is discussed
Amalberti, R., W. Nicklin, and J. Braithwaite. 2016. Preparing national health systems to cope with	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not explicit, but article to report on an international workshop previously conducted. No	Yes	Wide coverage, worldwide discussion encapsulating main issues associated with an ageing population	Yes	Recognise this paper made in association with the International Society of Quality in Health Care (ISQua)	Yes	Clear date acknowledgement as from 1960-currently (2016 when article was published). Key	Yes	Good summary of current worldwide problem, and nuance between cohorts of countries experienci

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
the impending tsunami of ageing and its associated complexities: Towards more sustainable health care. Int J Qual Health Care 28 (3):412-414. doi:10.1093/intqhc/mzw021.				method reported. Published in peer-reviewed journal				and participants from the countries involved. However, offers a balanced opinion of the issues discussed		references also included		ng an ageing population to different extents
Armstrong BK, Gillespie JA, Leeder SR, Rubin GL, Russell LM. Challenges in health	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clearly stated in presenting the challenges to make a sustainable	Yes	Focus on Australian health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Unique and useful article outlining some main challenges of healthcare, tailored to the health

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
and health care for Australia. *Medical Journal of Australia.* 2007;187(9):485-489.				healthcare system								system and context in question
Atmore C. The role of medical generalism in the New Zealand health system into the future. New Zealand Medical Journal. 2015;128(1419):50-55.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	New Zealand healthcare specific, but recognises that the solution could be applied to other health systems	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Emphasises the importance of being a generalist and how this could trailblaze this new role and system design for other countries
Barasa EW, Cloete K, Gilson L. From bouncing back, to	Yes	Authors have authority and are from various	Yes	Brief described and met. No methodolo	Yes	Worldwide coverage that aligns with the authors diverse	Yes	Well balanced presentation incorporating	Yes	Framed around the Ebola outbreak (2014-2016).	Yes	Relevant worldwide to all health systems

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
nurturing emergence: reframing the concept of resilience in health systems strengthening. *Health policy and planning.* 2017;32(suppl_3):iii91-iii94.		continents around the globe, relevant references included. Published in peer-reviewed journal		gy provided		backgrounds		worldwide need to nurture everyday resilience in healthcare, rather than just in emergencies		Contemporary references also used		
Bessler JS, Ellies M. Values and value--a vision for the Australian health care system. *Australian Health Review.* 1995;18(3):6-17;	Partially	Authors have authority in IT but not healthcare, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided, peer-reviewed	Yes	Focus on Australian health system	Yes	Author bias not explicitly stated, but standpoint is clear	Yes	Context of article identified as current (at time of publication). Key contemporary references included	Yes	Investigates the need for health reform to address rising costs with the health system and increase its sustainability

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
discussion 18-29.												
Birch S, Murphy GT, MacKenzie A, Cumming J. In place of fear: aligning health care planning with system objectives to achieve financial sustainability. Journal of Health Services & Research Policy. 2015;20(2): 109-114.	Yes	Authors have authority in a combination of fields (health economics, policy analysis, health services and nursing), relevant references included. Published in peer-reviewed journal	Yes	Clear brief in outlining the current healthcare expenditure, and creating the healthcare sustainability framework to identify determinants of healthcare expenditure, so that it can evolve with population needs	Yes	Worldwide, with examples from Australia, the UK and Canada	Yes	Authors standpoint clear. Examples from numerous countries and from reviews in the field, seems well balanced.	Yes	Context of article identifiable. Key contemporary references included	Yes	Presents a healthcare sustainability framework
Buchan J. What difference	Yes	Authors have authority,	Yes	Argument is clear	Yes	Worldwide context, relates	Yes	Authors standpoint is clear on	Yes	Context of article identifiabl	Yes	Contributes the importanc

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
does ("good") HRM make? *Human Resources for Health [Electronic Resource]*. 2004;2(1):6.		relevant references included. Published in peer-reviewed journal		and balanced		discussion to meeting the sustainable development goals, and discusses the role of human resource management in the health system		the importance of human resource management		e. Key contemporary references included		e of implementing, disseminating and sustaining good HRM in health systems
Buchan JM, Naccarella L, Brooks PM. Is health workforce sustainability in Australia and New Zealand a realistic	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, peer reviewed	Yes	Australia and New Zealand context	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important argument that the health systems in Australia and New Zealand need more focus on prevention, and increasing

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
policy goal? *Australian health review: a publication of the Australian Hospital Association*. 2011;35(2): 152-155.												the productivity of the health system
Burgess LH, Cohen MR, Denham CR. A new leadership role for pharmacists: a prescription for change. *Journal of patient safety*.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim and method well defined and adhered to	Yes	Worldwide, focusing on pharmacists as leaders	Yes	Author bias not explicitly stated, but standpoint is balanced and based on peer-reviewed literature	Yes	Context of article identifiable but date range of literature search not disclosed. Key contemporary references included	Yes	Argues for the importance of pharmacist leaders

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
2010;6(1):31-37.												
Casale CR, Clancy CM. Commentary: Not about us without us. *Academic Medicine.* 2009;84(10):1333-1335.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief to argue for the use of community-based participatory research for improving healthcare	Yes	Focus on United States of America health system	Yes	Author bias not stated, but recognises the bias in healthcare	Yes	Context of article identifiable. Key contemporary references included	Yes	Presents theoretical arguments for community-based participatory research in response to another article in the journal
Cashin A. The challenge of nurse innovation in the Australian context of universal health care. *Collegian.* 2015;22(3):319-324.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on Australian context, with emphasis on nurses	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article in detailing the concept of universal healthcare applied to Australia to empower nurse led health innovation

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Chambers DA, Glasgow RE, Stange KC. The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change. Implement Sci. 2013;8:117.	Yes	Authors have authority, relevant references included	Yes	Aim of research is clear in responding to two frequent assumptions about sustainability (voltage drop and program drift)	Yes	Specific to United States of America health system	Yes	Bias not explicitly stated but authors standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Significant as it adds the Dynamic Sustainability Network to the literature
Coiera E, Hovenga EJ. Building a sustainable health system. Yearb Med	Yes	Authors have authority, relevant references included	Yes	Research aim identified and met	Yes	Worldwide, but focuses on the sustainability of current health systems	Yes	Bias not explicitly stated but is present	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article with advice on the measurement and improvement of

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Inform 2007:11–8.												health system sustainability
Crisp N. What would a sustainable health and care system look like? *BMJ (Clinical research ed.).* 2017;358:j3895.	Yes	Authors have authority as a member of the House of Lords (and is talking specifically about the NHS), relevant references included. Published in peer-reviewed journal	Yes	Clear brief to argue that sustainability depends on seven factors and that cross-sectional partnerships are needed to increase resilience. No methodology provided	Yes	NHS specific	Yes	Authors standpoint is clear in their argument	Yes	No date specifically, but from 1978 at the Alma Ata Declaration onwards to time of publication (2017). Contemporary references also included	Yes	Recognition of some factors that need more attention, and also needs further underpinning by the economy and through creative partnerships
Delgado, P. 2016. Meeting the Challenge	Yes	Authors have authority, relevant references	Yes	Aim to explore the aims of the Atlantic	Yes	Designed to answer or discuss the aim. No	Yes	Bias not explicitly stated but authors standpoint	Yes	Context of article identifiable but not specific to	Yes	Contributes questions and suggestion

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
of Chronic Conditions in a Sustainable Manner: Building on the AHC Learning. Healthc Pap 15 Spec No:90-95; discussion 97-123.		included. Published in peer-reviewed journal		Healthcare Collaboration for Innovation and Improvement in Chronic Disease (AHC) and its areas of success and possible improvement		specific method section, but qualitative and quantitative methods employed in a separate article		is clear and based on evidence from past research		a particular 'date' e.g., research in area was published in 2005, whilst opinion piece published in 2016. However, other key contemporary references included		s for future research
Dhalla I. Canada's health care system and the sustainability paradox. *Cmaj*. 2007;177(1):51-53.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief stated, view is balanced with arguments from opposing view	Yes	Specific to Canadian health system, with Ontario as an example	Yes	Bias not explicitly stated, but work seems well balanced and acknowledges	Yes	Context of article identifiable. Key contemporary references included	Yes	Argument is relevant and adds new ideas to existing literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
								counter-arguments				
Edwards, N., M. Rowan, P. Marck, and D. Grinspun. 2011. Understanding whole systems change in health care: the case of nurse practitioners in Canada. Policy Polit Nurs Pract 12 (1):4-17.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear aim and methods provided	Yes	Specific to Canadian healthcare system	Yes	Bias not stated, article is balanced and limitations are acknowledged	Yes	Contemporary references included	Yes	Relevant to Canada's healthcare system
Ellner, A. L., S. Stout, E. E. Sullivan, E. P. Griffiths,	Yes	Authors have authority, relevant references included.	Yes	Aim to argue for increased support for health innovators	Yes	Define the scope of their article in introduction: defining	Yes	Argue that increased support is needed to advance healthcare	Yes	Context of article identifiable but not specific (identified	Yes	Relevant to US academic medicine, educating medical

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
A. Mountjoy, and R. S. Phillips. 2015. Health Systems Innovation at Academic Health Centers: Leading in a New Era of Health Care Delivery. Acad Med 90 (7):872-880. doi:10.1097/acm.0000000000000679.		Published in peer-reviewed journal		in academic health centres in the US, and define health system innovation		health system innovation, distinguishing it from quality improvement, and examining career opportunities for those who will lead health systems innovation		goals in academic health centers		as 21st century in article). Key contemporary references included		students, and trying to allow healthcare at a sustainable cost
Fineberg HV. Shattuck Lecture. A successful	Yes	Authors have authority, relevant references	Yes	Clear examination of USA health system	Yes	American healthcare context	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiable as after the 2010	Yes	Recognises that many steps are needed to

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
and sustainable health system--how to get there from here. New England Journal of Medicine. 2012;366(11):1020-1027.		included. Published in peer-reviewed journal		and how to increase its sustainability				is balanced		Patient Protection and Affordable Care Act. Key contemporary references included		ensure a sustainable health system, and identifies characteristics of a sustainable health system
Gruen RL, Elliott JH, Nolan ML, Lawton PD, Parkhill A, McLaren CJ, Lavis JN.	Yes	Authors have authority, relevant references included	Yes	Research aim and methods stated and met	Yes	Scope of article clearly defined	Yes	Author bias not stated but viewpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Contributes to conversation around health system sustainability
Greenhalgh, T., F. Macfarlane, C. Barton-Sweeney, and F. Woodard.	Yes	Authors have authority, relevant references included	Yes	Research aim and methods stated and met	Yes	Based in London health system, but significance extends	Yes	Bias minimized through administering of questionnaire by	Yes	Context of article identifiable. Key contemporary	Yes	Important article with significance for improving and

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
2012. "If we build it, will it stay?" A case study of the sustainability of whole-system change in London. Milbank Q 90 (3):516-547. doi:10.1111/j.1468-0009.2012.00673.x.						beyond that		blinded researchers		references included		scaling system change that can be applied to other health systems
Guyon A, Hancock T, Kirk M, et al. The weakening of public health: A threat to population health and	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on Canadian health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable and discusses current government policy (at time of publicatio	Yes	Identifies issues with government approach to public health and responds to each

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
health care system sustainability. *Canadian Journal of Public Health. Revue Canadienne de Sante Publique.* 2017;108(1):e1-e6.										n) in Canada. Key contemporary references included		
Hovenga EJ. Impact of data governance on a nation's healthcare system building blocks. *Studies in Health Technology & Informatics*	Partially	Authors have authority, relevant references included. Unable to determine if journal is peer-reviewed	Yes	Brief clear and met, no method provided	Yes	Worldwide, focusing on 'a nation' to explain national healthcare	Yes	Author bias not explicitly stated, standpoint based on reputable sources e.g., world health organisation	Yes	Context of article identified as current. Key contemporary references included	Yes	Important article educating readers about IT and healthcare and sustainability of that health system

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
. 2013;193:24-66.												
Inotai A, Petrova G, Vitezic D, Kalo Z. Benefits of investment into modern medicines in Central-Eastern European countries. Expert review of pharmacoeconomics & outcomes research. 2014;14(1):71-79.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim clearly stated and adhered to. No method provided	Yes	Specific to Central Eastern European countries	Yes	Authors standpoint is balanced, citing research and the WHO	Yes	Context of article identifiable. Key contemporary references included	Yes	Relevant, useful arguments for Central Eastern European health systems to consider
Kepros JP, Opreanu RC. A new model for	Yes	Authors have authority, relevant	Yes	Brief stated and examines the	Yes	United States of America	Yes	Authors standpoint clear, bias not	Yes	Context of article identifiable. Key	Yes	Adds historical context to relationshi

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
health care delivery. *BMC health services research.* 2009;9:57.		references included. Published in peer-reviewed journal		evolving relationship between hospitals, medical schools and physicians		health system		explicitly mentioned		contemporary references included		p between medical schools, hospitals and physicians, and examines the shared vision for the future
Knutson, D. J. 1997. The role of strategic alliances in ensuring health care quality: a health care system perspective. Clin Ther 19 (6):1572-1578.	Partially	Authors have authority, but no references included	Yes	Brief clear and met, no method provided	Yes	Specific to HealthSystems Minnesota, but may be applicable more widely	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article that focuses on the Chronic Illness Management Research and Development Project (CIMRDP) in Minnesota
Lehoux P, Williams-Jones B,	Yes	Authors are associated	Yes	Authors clear experts in	Yes	Coverage is worldwide	Yes	Authors have more knowledge	Yes	Context of article identifiabl	Yes	Applicable worldwide for

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Miller F, Urbach D, Tailliez S. What leads to better health care innovation? Arguments for an integrated policy-oriented research agenda. *Journal of Health Services & Research Policy.* 2008;13(4): 251-254.		with reputable organisations in their fields. Published in peer reviewed journal.		the field within the Canadian Health system, and contemporary references are cited. Published in peer reviewed journal		with very broad factors of sustainability being discussed, drawing on a workshop at an international conference		regarding Canadian system than worldwide and this is stated. The participants from the workshop at the Invitational Workshop of Innovations in Health, from which this paper arose, included participants from Canada, England, Wales, and		e. Key contemporary references included		industrialized countries to adopt a new kind of policy-oriented research based on relevance, usability and sustainability

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
								Finland. The event was funded by various Canadian grants. This standpoint is clear by the Authors, and yet their opinion piece seems balanced				
Levin L, Goeree R, Levine M, et al. Coverage with evidence development: the Ontario experience.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes		Yes	Focus on health system in Ontario, Canada	Yes					

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
International journal of technology assessment in health care. 2011;27(2):159-168.												
Lewis S. Can a learning-disabled nation learn healthcare lessons from abroad? *Healthcare policy = Politiques de sante.* 2007;3(2):19-28.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on Canadian health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Unique perspective, arguing for the focus on other aspects of the health system than its sustainability
Liaropoulos L, Goranitis I. Health care	Yes	Authors have authority, relevant	Yes	Brief clear and met, no method provided	Yes	Worldwide, but focusing on cost-	Yes	Author bias not explicitly stated, but	Yes	Context of article identifiable. Key	Yes	Investigates the sustainability of

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
financing and the sustainability of health systems. *International journal for equity in health.* 2015;14:80.		references included. Published in peer-reviewed journal				effectiveness of health systems		standpoint is balanced		contemporary references included		healthcare financing around the world
Lozano I, Rondan J, Vegas JM, Segovia E. Sustainability of the Health System: Beyond Cost-effectiveness Analyses. *Revista espanola de cardiologia (English*	Partially	Authors have authority, relevant references included. Journal not peer-reviewed	Yes	Brief clear in replying to original article. No methods	Yes	Spanish health system context	Yes	Author bias not explicitly stated, but standpoint is balanced in addressing original article's viewpoint and rebutting as appropriate	Yes	Context of article identifiable. Key contemporary references included	Yes	Argues that the Spanish health system has many strengths, but one of its weaknesses is the lack of sustainability

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
ed.). 2016;69(9): 880-881.												
Mackenzie J. The old care paradigm is dead, long live the new sustainable care paradigm: how can GP commissioning consortia meet the demand challenges of 21st century healthcare? *London journal of primary care.*	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Focus on United Kingdom	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable as beginning from 1948 until present. Key contemporary references included	Yes	Examines the significance of prevention rather than treatment to increase the sustainability of the health system

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
2011;4(1):64-68.												
Magnan S, Fisher E, Kindig D, et al. Achieving accountability for health and health care. *Minnesota medicine*. 2012;95(11):37-39.	Partially	Authors have authority, relevant references included. Journal not peer-reviewed	Yes	Clear aim that is fulfilled, no method supplied	Yes	Focus on United States of America health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Recognises the importance of the triple aim in healthcare sustainability
McGorry PD, Hamilton MP. Stepwise expansion of evidence-based care is needed for mental health reform. *The Medical*	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief well defined and adhered to. No methodology present	Yes	focus on Australia and the mental health sector	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Recognises the challenges in the system of

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
journal of Australia. 2016;204(9):351-353.												
McIntosh E, Nagelkerk J, Vonderheid SC, Poole M, Dontje K, Pohl JM. Financially viable nurse-managed centers. *Nurse Pract.* 2003;28(3):40, 46-48, 51.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not clear, but brief clear and examples used to explain argument. Peer reviewed	Yes	Focus on the role of finance committees in nurse managed centres in the United States of America	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article on nurse managed centres and how they function
Nagle LM, Pitts BM. Citizen perspectives on the future of	Partially	Authors have authority, relevant references included.	Yes	Brief clearly stated and met. No methods provided	Yes	Focus on health system in Ontario, Canada	Yes	Author bias not explicitly stated, but standpoint	Yes	Date is explicit (comments on the panel that met from	Yes	Summaries the recommendations for sustainability from

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
healthcare. *Healthcare Quarterly.* 2012;15(2): 40-45.		Journal not peer-reviewed						is balanced		April-June 2011). Contemporary references also included		the unique panel of Ontarians
Pacifico Silva H, Lehoux P, Miller FA, Denis JL. Introducing responsible innovation in health: a policy-oriented framework. *Health Research Policy & Systems.* 2018;16(1): 90.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Research aim identified and met. No method provided	Yes	Worldwide, with examples from the United States and European Union	Yes	Author bias not explicitly stated, but bias of technologies being discussed is explicitly stated	Yes	Context related to responsible research and innovation in health, and thus is centred on when the research on this topic increased	Yes	Contributes responsible innovations in health framework, with nine dimensions organised into five domains
Pencheon D. Developing a	Yes	Authors have authority, relevant	Yes	Brief clear and met, no method provided	Yes	England NHS context	Yes	Author bias not explicitly stated, but	Yes	Context identified as the five years	Yes	Important article highlighting ways in

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
sustainable health and care system: lessons for research and policy. *Journal of Health Services & Research Policy*. 2013;18(4): 193-194.		references included. Published in peer-reviewed journal						standpoint is balanced		previous to publication in 2013 (where future-proofing the healthcare was attempted)		which the health system can be sustained
Pronovost, P. J., C. G. Holzmueller, T. Callender, R. Demski, L. Winner, R. Day, J. M. Austin, S. M. Berenholtz, and M. R. Miller. 2016. Sustaining	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not explicit, but article brief is provided. Methodology provided and adhered to	Yes	Specific and well defined: Johns Hopkins Hospital in 2012-2014	Yes	Authors clear that they conducted previous research in measuring results of sustainability improvement measures (2012) and the	Yes	Clear date acknowledged from 2012 (initial results) to 2013	Yes	Suggests quality could improve through applying the framework used at Johns Hopkins Hospital (JHH)

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Reliability on Accountability Measures at The Johns Hopkins Hospital. Jt Comm J Qual Patient Saf 42 (2):51-60.								author's efforts to sustain them				
Robertson TM, Lofgren RP. Where population health misses the mark: breaking the 80/20 rule. *Academic Medicine.* 2015;90(3): 277-278.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	No aim, but brief clearly stated. Relevant references included. Published in peer reviewed journal.	Yes	United States health context	Yes	Bias not explicitly stated but states the aim to reduce healthcare spending through analysis of medical insurance claim records	Yes	Context of article identifiable. Key contemporary references included	Yes	Adds to the argument of the importance of identifying health spending and working on reducing it where possible

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Rosenberg-Yunger ZR, Daar AS, Singer PA, Martin DK. Healthcare sustainability and the challenges of innovation to biopharmaceuticals in Canada. *Health policy (Amsterdam, Netherlands).* 2008;87(3): 359-368.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief comprising three parts to review government response to biopharmaceuticals and health system sustainability	Yes	Focus on Canada health system	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Contributes recommendations for the field regarding access to biopharmaceuticals
Rosser, M. 2006. Advancing health system	Partially	Authors have authority, but no	Yes	Research aim identified and met	Yes	Focus on Canadian health system	Yes	Clear from the article even though bias is not	Yes	Context of article covers from 1997 (inception	Yes	Significance evident in the "lessons

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
integration through supply chain improvement. Healthc Q 9 (1):62-66, 64.		references included						specifically mentioned that the stance of the article is that HMMS are beneficial		of HMMS) and 2006 (article publication). No references included		learned" section
Scott IA. Is modern medicine at risk of losing the plot? *The Medical journal of Australia.* 2006;185(4):213-216.	Yes	Authors have authority, journal is peer-reviewed	Yes	Examines if pledges by Australian Government for improvements to healthcare are sustainable financially, and in terms of behaviour change on the front line	Yes	Specific to Australian population healthcare spending, and the private health insurance system of Australia	Yes	Clear opinion but well balanced argument	Yes	Context of article identifiable. Key contemporary references included	Yes	Relevant, adds context to Australian health. Encourages different aspects of the health system to work together

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Sepehri A, Chernomas R. Is the Canadian health care system fiscally sustainable? *International Journal of Health Services.* 2004;34(2): 229-243.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clearly described and met. No methodology	Yes	Specific to Canadian context	Yes	Contains well balanced review of literature, and compares the health systems of Canada and the United States	Yes	Context of article identifiable. Key contemporary references included	Yes	Argued for the best way to increase the sustainability and economic viability of the national Canadian health system
Shigayeva A, Coker RJ. Communicable disease control programmes and health systems: an analytical approach to sustainabili	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim clearly stated and met. No methodology	Yes	Worldwide context, but focus on disease control programs	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Important article that proposes characteristics and a framework that may have the potential for sustainability

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
ty. *Health policy and planning.* 2015;30(3): 368-385.												
Sonnenreich P, Geisler L. Covering the Cost of the Cure: From Hepatitis C to Cancer, New Therapies Are Straining a System Plagued by Inefficiency. *P T.* 2016;41(9): 565-589.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Aim not clear, but brief clear and examples used to explain argument. Peer reviewed	Yes	Focus on United States of America health system	Yes	Author bias not explicitly stated, but standpoint is balanced with research from other researchers and articles	Yes	Context of article identifiable. Key contemporary references included	Yes	Examines the evolving notions of value in healthcare, cost vs cure,
Stoelwinder JU, Paolucci F. Sustaining Medicare	Yes	Authors have authority, relevant references	Yes	Brief clear and met, peer reviewed	Yes	Focus on how Australia can learn from the	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiable as contempor	Yes	Extracts the applicatio n to Australia

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
through consumer choice of health funds: lessons from the Netherlands. *Medical Journal of Australia.* 2009;191(1):30-32.		included. Published in peer-reviewed journal				Netherlands health system		is balanced. Authors are affiliated with Australian institutions		ary. Key contemporary references included		of the Netherlands policies.
Stoelwinder JU. Final report of the National Health and Hospitals Reform Commission: will we get the health care governance reform we need? *The Medical*	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Specific to Australian health system	Yes	Author bias not explicitly stated, but standpoint is balanced. Also of note, author declares conflict of interest as they are a board member of	Yes	Context of article identifiable and there is explicit reference to the actions of the National Health and Hospitals Reform Commission and federal	Yes	Timely article suggesting changes to Australian health system

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
journal of Australia. 2009;191(7):387-388.								Medibank Private		governme nt response. Key contempor ary references included		
Stuart N, Adams J. 2007. The sustainabili ty of Canada's healthcare system: a framework for advancing the debate. Healthcare Quarterly 10: 96–103.	Parti ally	Authors have authority, relevant references included. Journal not peer-reviewed	Yes	Brief clear and met, no method provided, peer-reviewed	Yes	Focus on Canadian healthcare	Yes	Author bias not explicitly stated, but standpoint is balanced and bias within the healthcare system is identified and discussed	Yes	Context of article identifiabl e. Key contempor ary references included	Yes	Examines the importanc e of improving the sustainabil ity of the Canadian health system
Taylor M. Australian health care reform: a place for	Parti ally	Author informatio n not available, journal not	Yes	Clear brief to discuss role of NPs in Australia	Yes	Focus on the role of nurse practitione	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiabl e as after the 2010	Yes	Recognise s and emphasise s the emerging

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
nurse practitioners? Aust Nurs J. 2007;15(6): 20-23.		peer-reviewed. However, relevant and peer-reviewed references are included		and how the role can be sustainable		rs in Australia		is justified by numerous government reports		Patient Protection and Affordable Care Act. Key contemporary references included		role of the nurse practitioner, and how it can be sustained
Thompson RE. Sustainability as the lynch pin of public policy and industry initiatives. *Physician executive.* 1998;24(4): 52-55.	Partially	Authors are associated with reputable organisations in their field. However, journal is not peer-reviewed	Partially	No clearly stated brief, starts with USA health political history and then to discuss managed care	Yes	American population health	Partially	Authors standpoint is clear in their argument. However, it is not particularly balanced in presentation.	Partially	Context of article identifiable. Majority of references are not contemporary	Yes	Promotes discussion regarding healthcare in the USA, and if and how managed care can be sustainable
Tsasis P. Chronic disease management and the home-care	Yes	Authors have authority, relevant references included.	Yes	Brief clear and met, no method provided	Yes	Focus on health system in Ontario, Canada	Yes	Author bias not explicitly stated, but standpoint	Yes	Context of article identifiable. Key contemporary	Yes	Important article, justified in terms of health of Canadians

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
alternative in Ontario, Canada. Health Serv Manage Res. 2009;22(3): 136-139.		Published in peer-reviewed journal						is balanced		references included		, and financial improvement
Van de Pas R, Hill PS, Hammonds R, et al. Global health governance in the sustainable development goals: Is it grounded in the right to health? *Global challenges (Hoboken, NJ).* 2017;1(1):47-60.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief regarding analysis of the roots of the sustainable development goals in the right to health	Yes	Worldwide, focusing on the sustainable development goals	Yes	Author bias not explicitly stated, but standpoint is balanced and urban bias is discussed	Yes	Context of article identifiable as post-2015 sustainable development goals. Key contemporary references included	Yes	Unique argument, questions if the sustainable development goals satisfy the right to health, and concludes that they do not

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Veillard J, Denny K. Transformation through Clinical and Social Integration: Meeting the Needs of High Users of Healthcare. *Healthcare Papers.* 2014;14(2): 4-7.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Clear brief in observations regarding the use of the health system by a minority of the population	Yes	Focus on Canadian health system, especially Ontario, but message is applicable worldwide	Yes	Author bias not explicitly stated, but standpoint is well balanced with arguments on many perspectives discussed	Yes	Context of article identifiable. Key contemporary references included	Yes	Argues five points regarding Ontario's health system and the potential for improvement
Wakerman J, Humphreys JS. Sustainable workforce and sustainable health systems for rural and remote	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	Brief clear and met, no method provided	Yes	Specific to rural and remote Australia	Yes	Author bias not explicitly stated, but standpoint is balanced	Yes	Context of article identifiable. Key contemporary references included	Yes	Recognises interdependence of the health system of urban and rural areas

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Australia. *The Medical journal of Australia.* 2013;199(5 Suppl):S14-17.												
Woodward, G. L., A. Iverson, R. Harvey, and P. G. Blake. 2015. Implementation of an agency to improve chronic kidney disease care in Ontario: lessons learned by the Ontario Renal Network.	Yes	Authors have authority, relevant references included. Published in peer-reviewed journal	Yes	The aim is adhered to, but there is no relevant methodology.	Yes	Limits of article known (to identify lessons learnt from the CKD agency to improve care)	Yes	Argument that the CKD system has been effective and sustainable	Yes	Context of article identifiable. Key contemporary references included	Yes	Identifies methods used for improving CKD care and their success

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Healthc Q 17 Spec No:44-47.												
Pisco L, Pinto LF. From Alma-Ata to Astana: the path of Primary Health Care in Portugal, 1978-2018 and the genesis of Family Medicine. Ciencia & saude coletiva. 2020	Yes	All authors from reputable institutions		Peer reviewed, but no aim or methodology	Yes	Portugal only	Yes		Yes	Recent references included	Yes	
Ganann R, Peacock S, Garnett A, et al.	Yes	All authors from reputable	Yes	Clear aim and adhered to	Yes	Context clearly stated and clear limits	Yes	Bias not explicitly stated	Yes	Recent references included	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Capacity development among academic trainees in community-based primary health care research: The Aging, Community and Health Research Unit Experience. Prim Health Care Res Dev. 2019;20:e139.		institutions										
Jessup RL, O'Connor DA,	Yes		Yes		Yes		Yes		Yes		Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Putrik P, et al. Alternative service models for delivery of healthcare services in high-income countries: a scoping review of systematic reviews. BMJ open. 2019;9(1): e024385.												
Vainieri M, Noto G, Ferre F, Rosella LC. A Performance Managem	Yes	All authors from reputable institutions	Yes		Yes	Explicitly mentions bias	Yes		Yes	Recent references included	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
ent System in Healthcare for All Seasons? International Journal of Environmental Research & Public Health [Electronic Resource]. 2020;17(15):03												
Braithwaite J, Mannion R, Matsuyama Y, et al. The future of health systems to 2030: a	Yes	All authors from reputable institutions and published extensively in field	Yes	Relevant references	Yes	Includes information on 152 countries	Yes		Yes	Recent references included	Yes	Adds meaningfully and enriches current literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
roadmap for global progress and sustainability. International journal for quality in health care: journal of the International Society for Quality in Health Care. 2018;30(10):823-831.												
Buttigieg SC. Innovation Strategies	Yes	All authors from reputable	Yes		Yes		Yes	Notes need to address contextual	Yes	Recent references included	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
and Health System Guiding Principles to Address Equity and Sustainability in Responsible Innovation in Health Comment on "What Health System Challenges Should Responsible Innovation in Health Address? Insights		institutions						differences				

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
From an International Scoping Review". Int. 2019;8(9): 570-572												
Byskov J, Maluka S, Marchal B, et al. A systems perspective on the importance of global health strategy developments for accomplishing today's Sustainable Development Goals.	Yes	All authors from reputable institutions worldwide	Yes	Aim clearly stated and met	Yes	Coverage based on aim being met	Yes	Balanced standpoint	Yes	Relevant contemporary references included	Yes	Brings suggested ways forward to achieve the SDGs

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Health policy and planning. 2019;34(9):635-645.												
O'Brien N, Li R, Isaranuwatchai W, et al. How can we make better health decisions a Best Buy for all?: Commentary based on discussions at iDSI roundtable on 2 (nd) May 2019 London, UK. Gates	Yes	All authors from reputable colleges, peer reviewed article	Yes	Peer reviewed, authoritative references	Yes	Covers health technology assessment (HTA)	Yes	Bias not explicitly stated but balanced standpoint with WHO and country and local evidence	Yes	Contemporary references included	Yes	Adds to the literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
open research. 2019;3:1543.												
Hanney S, Kanya L, Pokhrel S, Jones T, Boaz A. WHO Health Evidence Network Synthesis Reports. What is the evidence on policies, interventions and tools for establishing and/or strengthening national health	Yes	WHO authority, as well as individual authors	Yes	Authoritative, clear aim met	Yes	Scoping review parameters well defined	Yes	Bias not explicitly stated but balanced standpoint with WHO and country and local evidence	Yes	Contemporary references included	Yes	Has considerations for policy analysis in many countries

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
research systems and their effectiveness? Copenhagen: WHO Regional Office for Europe © World Health Organization 2020.; 2020												
Braithwaite J, Vincent C, Nicklin W, Amalberti R. Coping with more people with more illness. Part 2: new generation	Yes	Well published authors in the field	Yes	Authoritative references in the field, aim strategy met	Yes	Global, but strategy for ISQua well defined	Yes	Balanced standpoint, evidence from sources from around the world	Yes	Context well defined, contemporary references used	Yes	Important paper adding to literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
of standards for enabling healthcare system transformation and sustainability. International Journal for Quality in Health Care. 2019;31(2):159-163												
Braithwaite J, Zurynski Y, Ludlow K, Holt J, Augustsson H, Campbell M.	Yes	Well published authors in the field	Yes	Authoritative references	Yes	Global but well defined protocol	Yes	Balanced standpoint, bias explicitly addressed	Yes	Date to be used well defined, contemporary references used	Yes	Significant and important for the field

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Towards sustainable healthcare system performance in the 21st century in high-income countries: a protocol for a systematic review of the grey literature. BMJ open. 2019;9(1): e025892												
Martiniuk AL, Colbran R, Ramsden R, et al. Capability	Yes	Authoritative authors	Yes	Authoritative references	Yes	Coverage well defined	Yes	Balanced standpoint	Yes	Contemporary references included	Yes	Important and adds to the field

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
... what's in a word? Rural Doctors Network of New South Wales Australia is shifting to focus on the capability of rural health professionals. Rural and remote health. 2020;20(3):5633												
Rudnicka E, Napierała P, Podfigurna A, Męczekal	Yes	Peer revied journal article	Yes	Peer-reviewed	Yes	Aimed to coverage global perspective and achieved it	Yes	Authors standpoint is clear, relatively balance presentation	Yes		Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
ski B, Smolarczyk R, Grymowicz M. The World Health Organization (WHO) approach to healthy ageing. Maturitas. 2020;139:6-11.												
Walsh K. Strengthening primary care: the role of e-learning. Educ. 2019;30(5):267-269.	Yes	Author has a strong publication record in peer reviewed journals	Yes	Peer reviewed	Yes		Yes	No bias stated but is a balanced commentary	Yes	Contemporary references included, date is discernible by subject matter	Yes	
De Santis M. Integrated	Yes	Authors both appear to	Yes	Peer reviewed	Yes	Looking at studies published	Yes	No bias stated,	Yes	Recent references included,	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
care for healthcare sustainability for patients living with rare diseases. Annali dell'Istituto superiore di sanita. 2019;55(3):276-282.		have roles in prominent rare disease organisations in Europe				between 2000 and 2018. Search terms provided, both grey lit and PR included		standpoint is clear		date is discernible		
Ferrelli RM, Fantini B, Taruscio D. Health systems sustainability for rare diseases. Preface. Annali dell'Istituto	Yes	Authors either work for rare diseases network in Europe or in the ministry of health in Italy	Yes	Book chapter-editors are all from reputable organisations	Yes	Europe specific with focus on rare diseases	Yes	No bias stated, standpoint is clear	Yes	Contemporary references, the context is very clear	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
superiore di sanita. 2019;55(3):249-250.												
Steenhuis S, Struijs J, Koolman X, Ket J, E VDH. Unraveling the Complexity in the Design and Implementation of Bundled Payments: A Scoping Review of Key Elements From a Payer's Perspective. Milbank	Yes	Authors have peer reviewed publication history	Yes	Aim stated, clear methodology	Yes	Limits stated in the methodology- review related to payment methods, relevant to OECD countries	Yes	Authors address risk of bias, there is a balanced standpoint presented	Yes	Contemporary references included, date is discernible throughout the text	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Quarterly. 2020;98(1):197-222.												
Nikolić B. Applicability of European Union Competition Law to Health Care Providers: The Dividing Line between Economic and Noneconomic Activities. Journal of health politics, policy and law. 2020.	Yes	Contemporary references, author from reputable source	Yes	Aim clearly stated and met	Yes	Clear coverage within EU	Yes	Authors opinion is balanced by contemporary references and different standpoints	Yes	Context clear, contemporary references present	Yes	Important article that helps make the legal uncertainty clear
Niraula S. Strategizi	Yes	Authoritative author,	Yes	Clearly stated	Yes	Coverage specific to	Yes	balanced standpoint	Yes	Universal healthcare	Yes	Adds context,

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
ng health technology assessment for containment of cancer drug costs in a universal health care system: Case of the pan-Canadian Oncology Drug Review. Cancer. 2019;125(18):3100-3103.		detailed reference list		brief, peer reviewed article		Canadian oncology drug review				system in Canada since 1968, and has been deduced with contemporary references		important yet specific article
Wurcel V, Cicchetti A, Garrison L, et al.	Yes	Authors experts in the field	Yes	Peer-reviewed article, clear aim and	Yes	Coverage specific to the VODI published articles	Yes	Balanced standpoint with examples	Yes	Contemporary references included,	Yes	Important addition regarding value of diagnostic

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
The Value of Diagnostic Information in Personalised Healthcare: A Comprehensive Concept to Facilitate Bringing This Technology into Healthcare Systems. Public Health Genomics. 2019;22(1-2):8-15.				methodology				and references				information (VODI)

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Cunningham FC, Ranmuthugala G, Westbrook JI, Braithwaite J. Tackling the wicked problem of health networks: the design of an evaluation framework. BMJ open. 2019;9(5): e024231.	Yes	Authors authoritative in field, detailed reference list	Yes	Clearly stated aim and methods adhered to. Work is representative of the field	Yes	Evaluations of systematic reviews to date	Yes	Balanced standpoint	Yes	Date discernible, contemporary references present	Yes	Meaningful contribution to literature
Embi PJ, Richesson R, Tenenbaum J, et al. Reimagining the	Yes	Authoritative authors from well-respected institutions	Yes	Clear aim highlighted and met	Yes	Specific to covering what was discussed and the findings from the	Yes	Balanced standpoint with contributions from over 70 participant	Yes	Discernible from references as well as timing of meeting	Yes	Synthesised findings from meeting and adds to literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
research-practice relationship: policy recommendations for informatics-enabled evidence-generation across the US health system. JAMIA open. 2019;2(1): 2-9.						2016 AMIA meeting		s at meeting		reported on		
Park YL, Canaway R. Integrating Traditional and Complementary Medicine with	Yes	Authoritative authors	Yes	Peer reviewed journal	Yes	limits clearly stated with Western Pacific region	Yes	Bias not explicitly stated, but expert balanced standpoint drawing on experiences from	Yes	Date discernible, contemporary references present	Yes	Interesting and unique article, adds to the literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
National Healthcare Systems for Universal Health Coverage in Asia and the Western Pacific. Health syst. 2019;5(1): 24-31.								many countries				
Quaglio G, Figueras J, Mantoan D, et al. An overview of future EU health systems. An insight into governanc	Yes	Authors have all previously published extensively in this field	Yes	Published in peer reviewed journal. Aim isn't explicitly presented, but article is referencing/ reporting on workshop	Yes	EU specific context	Yes	Author bias isn't stated, but discussion presents clear standpoint and is balanced	Yes	References workshop in 2017 that inspired the publication, references recent literature	Yes	Contributes meaningfully to discussion of HSS in the EU

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
e, primary care, data collection and citizens' participation. Journal of public health (Oxford, England)				held in parliament								
Lehoux P, Roncarolo F, Silva HP, Boivin A, Denis JL, Hebert R. What Health System Challenges Should Responsible Innovation in Health	Yes	Authors have strong publication record in PR journals	Yes	Aim stated, methods clearly stated, published in PR journal aim stated, methods clearly stated, published in PR journal	Yes	International scoping review with well defined parameters and search strategy	Yes	Bias isn't stated but limitations of review are, and standpoint is balanced	Yes	Articles included for review span 2000-2016.	Yes	Very detailed scoping review, identifies a number of challenges facing global health systems

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Address? Insights From an International Scoping Review. Int. 2019;8(2): 63-75.												
Editorial. Healthcare quarterly (Toronto, Ont.). 2020;22(4)		Authors not stated- editors of Healthcare Quarterly- a		Commentary- no aim or methods	Yes	Canada specific	Yes	Standpoint clear	Yes	Context is article is identifiable because of contemporary references		
Abimbola S, Baatiema L, Bigdeli M. The impacts of decentralization on health system	Yes	Authors from reputable institutions with good publication records in peer	Yes	Clear methodology/ search strategy. In peer reviewed journal. No aim explicitly stated	Yes	Wide coverage- looking at low/middle and high income countries	Yes	Author bias not stated, but balanced standpoint	Yes	Context of article identified	Yes	Identified three mechanisms by which decentralization may influence equity,

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
equity, efficiency and resilience: a realist synthesis of the evidence. Health Policy & Planning. 2019;34(8):605-617		reviewed journals										efficiency, and resilience in 25 countries (low middle and high income)
Craig N, Robinson M. Towards a preventative approach to improving health and reducing health inequalities: a view from Scotland.	Yes	Both authors affiliated with the NHS	Yes	no aims or method stated but is peer reviewed and well referenced	Yes	Scotland specific	Yes	Author bias not stated but viewpoint is clear	Yes	Context easy to discern based on references and analysis of trends in previous 10-15 years	Yes	Useful in Scottish context

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Public health. 2019;169: 195-200.												
Costa-Font J, Levaggi R. Innovation, aging, and health care: Unraveling "silver" from "red" herrings? Health Econ. 2020;29 Suppl 1:3-7.	Yes	Both authors have strong publication history and are associated with reputable institutions. Published in peer reviewed journal	Yes	Peer reviewed, no aim or method stated	Yes	special issue presents papers presented at a workshop	Yes	There isn't a bias stated	Yes	discernible from references	Yes	
Derakhshani N, Doshmangir L, Ahmadi A, Fakhri A,	Yes	Authors have strong publication history	Yes	Detailed methods and search strategy	Yes	Parameters defined in search strategy	Yes	Bias not stated, viewpoint clear	Yes	Context is discernible	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Sadeghi-Bazargani H, Gordeev VS. Monitoring Process Barriers and Enablers Towards Universal Health Coverage Within the Sustainable Development Goals: A Systematic Review and Content Analysis. ClinicoEconomics and outcomes												

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
research : CEOR. 2020;12:459-472												
Clancy C. Creating World-Class Care and Service for Our Nation's Finest: How Veterans Health Administration Diffusion of Excellence Initiative Is Innovating and Transforming Veterans		Author affiliated with VA, no publication record	Yes	In peer reviewed journal	Yes	Restricted to VA			Yes	Date and context discernible from text		

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
Affairs Health Care. Perm. 2019;23												
Marcotte LM, Moriates C, Wolfson DB, Frankel RM. Professionalism as the Bedrock of High-Value Care. Academic Medicine. 2020;95(6):864-867.	Yes	Authors have strong publication record	Yes	Peer reviewed	Yes	No limits stated, but is restricted to looking at healthcare professionals (in US context)	Yes	Bias not explicitly stated, but standpoint is balanced	Yes	Date/ context discernible from text	Yes	
Witter S, Palmer N, Balabanova D, et al. Health	Yes	Authors have strong publication record	Yes	Peer reviewed, but there is no aims or methods	Yes	Looked at studies published between 2000 and 2018	Yes	Acknowledgement of biases and limitations; well	Yes	Context discernible from references	Yes	Contributes to the literature

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
system strengthening-Reflections on its meaning, assessment, and our state of knowledge. International Journal of Health Planning & Management. 2019;34(4):e1980-e1989						focussed on interventions in LMIC		balanced standpoint				
Sturmberg JP. Resilience for health-an emergent property	Yes	Author has publication record in this field	Yes	Peer reviewed, but there is no aims or methods		Limits not stated		No bias stated		No discernible date	Yes	Contributes to conversation around health system resilience

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
of the "health systems as a whole". Journal of evaluation in clinical practice. 2018;24(6):1323-1329.												
Thistlethwaite JE, Dunston R, Yassine T. The times are changing: workforce planning, new health-care models and the need for interprofessional	Yes	Authors from reputable institutions	Yes	Peer reviewed	Yes	Specific to Australia/ the Australian health system	Yes	Bias not explicitly stated, but standpoint is balanced	Yes	References contemporary reports about Australian health system. Context is discernible	Yes	

Reference	Authority		Accuracy		Coverage		Objectivity		Date		Significance	
	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment	Yes or no?	Comment
education in Australia. Journal of interprofessional care. 2019;33(4):361-368.												
Iskrov G, Stefanov R, Ferrelli RM. Health systems for rare diseases: financial sustainability. Annali dell'Istituto superiore di sanita. 2019;55(3):270-275	Yes	Authors have strong publication record	Yes	No clear aim stated, but there is clear methodology and paper has been peer reviewed	Yes	Covers health systems in EU member states	Yes	Balanced standpoint	Yes	References contemporary reports about health systems in the EU-context is very clear	Yes	Contributes to the literature

PRISMA CHECKLIST

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	4
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	4-5
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	7-8
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	8
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	9-10
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	9-10, Additional file 1
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Additional file 1
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	9-11
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	N/A
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Table 1, page 10
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	11

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	9-11
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	11-13
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	11-13
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	13
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	11-21
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	13-21
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	22-25
Limitations	20	Discuss the limitations of the scoping review process.	25
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	26
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	28

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.