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Abstract

Across OECD countries, aging populations and increasing numbers of people with chronic diseases shift the focus of health care delivery beyond acute hospital care. Almost two in three people aged over 65 years live with at least one chronic condition often requiring multiple interactions with different providers, making them more susceptible to poor and fragmented care. This has prompted calls for making health systems more people-centred, and has fuelled debate on the need for integrated delivery systems capable of continuous, co-ordinated, and high-quality care delivery throughout people's lifetime. Despite promising, mostly local-level, experiences of integrated care models, health care systems remain fragmented, focused on episodic acute care and unsuitable to solve complex health needs. Moreover, assessing and quantifying the benefits of integrated care in a comparable way remains difficult due to the lack of technically sound, policy-relevant indicators of care integration. The COVID-19 pandemic has amplified the need for various parts of the health systems to work together to deliver seamless care. New models of care delivery are relocating acute care outside the hospital, broadening coverage of primary health care, accentuating home based care and blurring the boundaries between health and social care, whilst increasingly relying on digital solutions.

This report presents the results of the first OECD pilot over the period 2020-2021 that developed quality and outcome indicators to support cross-country comparisons of the delivery of integrated care. A new generation of indicators was published in *Health at a Glance 2021* to launch international benchmarking of quality measurement of integrated care. The results and experience with the pilot call for further work on four fronts: (1) expanding work on indicator development; (2) performing policy analysis to better understand cross-country variations and influencing factors such as health financing and governance models; (3) encouraging more countries to upscale data linkage and measure delivery of integrated care; and (4) developing new measures of the level of integration of OECD health systems.

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Executive Summary

Across OECD countries, aging populations and an increasing population of people living with chronic diseases has shifted the focus of care delivery beyond acute hospital care. Almost two in three people aged over 65 years live with one or more chronic conditions often requiring multiple interactions with different providers, making them more susceptible to poor and fragmented care. Ensuring health systems are people-centred is a goal of most countries. This requires integrated systems capable of continuous, co-ordinated, and high-quality health care delivery throughout people's lifetime. Despite promising, mostly local-level, experiences of integrated care models, systems remain fragmented, focused on episodic acute care and unsuitable to solve complex health needs.

Conducting valid international comparisons of the benefits of integrated care remains difficult due to the lack of technically sound, policy-relevant indicators of care integration. This report presents the *state of art* on national best practices of performance measurement of integrated care and provide results and lessons of the first OECD pilot on Integrated Care undertaken in 2020-2021 to support international comparisons of integrated care delivery, published in *Health at a Glance 2021*.

The report provides five key messages:

1. When reviewing **national best practices**, countries collect a growing volume of data but the lack of systematic data linkage at patient level undermines the value of the data to inform performance measurement for integrated care. To signal poor health systems performance, a third of OECD countries monitor readmission rates and link hospital data to death registries and other key data sets to follow up patients after hospitalisation. However, other databases available in their data systems that are valuable to inform patient-centred health care delivery are not considered and linked.
2. The **2020-2021 OECD pilot data on Integrated Care covered 15 countries** and developed a *new generation* of indicators. These indicators are developed using linked data on mortality, readmissions and prescribed medicines for post-discharge care in stroke (both ischaemic and haemorrhagic) and congestive heart failure (CHF) patients. Using a stringent definition of cohort, data was linked at the patient-level over a six-year period to enhance comparability of patient profiles across countries and identification of occurrence of first episodes of stroke and CHF.
3. The pilot showed **data collection demonstrated feasibility, but linkage remains a challenge**. The pilot collected data from 15 countries on mortality and readmissions within one year after discharge from hospital. Only four countries (Czech Republic, Denmark, Finland and Sweden) provided post-discharge medicine prescription data. Most countries submitted data for the period 2013-2018 and stratified data for 10-year age and sex breakdowns, as well as stroke related ICD-10 code level data.
4. Data analysis suggests that **OECD average masks large cross-country variations** in outcomes within one year after discharge. For example, the average OECD mortality rate over one year for ischaemic stroke was 14%, but the range was from 5% to 25%. Trend analysis within countries shows improvements in outcomes. Multiple outcome indicators are required to measure integrated

care and this will benefit from increased data linkages at the patient level. Within this data collection it is encouraged to further use data linkage to calculate medicine prescription indicators. The data on prescription rates of appropriate medication 12 to 18 months after hospital discharge provides insights over the variations in the quality of integration between hospital and community care. The data on prescription also improves the interpretability of readmission and mortality indicators.

5. Given the lessons learnt with the pilot, the following actions might improve the international comparability of future data collections: **to cease** data collection on haemorrhagic stroke indicators and on stratification by ICD-10 code level; **to revise** the medication list of prescribing indicators and the data specifications to restrict calculations to age cohorts aged 45 and above; and, **to amend** the indicator specification of prescribing indicator for CHF as well as to use the 2018 disease specific population as the reference population for standardisation. Next steps involve integration into the regular OECD HCQO data collection of the mortality and readmission indicators.

- This paper proposes further work on:
  - (1) **expanding indicator development** for future data collections in three possible directions:
    - (i) ***Go broad***- by expanding work to other patient cohorts, conditions and diseases —such as asthma, COPD, diabetes, hip/knee fracture, cancer care, mental health and maternity care –or vulnerable people such as older people, people with multimorbidity;
    - (ii) ***Go deep-*** by expanding work to consider longer care trajectories and further linkages to gain an understanding of patient trajectories along the health system, including before hospitalisation, and between health and social care that could inform analysis of patterns of care for vulnerable people (e.g. long-term care residents, people suffering from mental health conditions, socioeconomically deprived people) or the whole population;
    - (iii) ***Go towards other dimensions***- by expanding work to measure other performance dimensions such as access, utilisation and cost, for example, new indicators could measure utilisation and timing of primary care and transitions of care from/to hospital to outpatient specialist care; average length of stay or delayed discharges. Further work could also involve using linked data to understand variation at a sub-national level.
  - (2) **performing policy analysis** to explore cross-country variations by mapping integrated care policies across OECD countries and reviewing system-level care integration innovations, particularly those spurred by COVID-19, and policies in the areas of governance and organisation of care delivery, data and information systems, and health financing;
  - (3) **encouraging more countries to upscale data linkage** and measure delivery of integrated care for longer time series to support trend analysis; and
  - (4) **developing new measures of patient-centred level of integration** of OECD health systems, for example, by measuring the number of different providers visited in one year by a patient with specific health needs.

Résumé et points saillants

Dans les pays de l'OCDE, le vieillissement de la population et l'augmentation du nombre de personnes souffrant de maladies chroniques ont modifié l'orientation de la prestation des soins au-delà des soins hospitaliers actifs. Près de deux personnes sur trois âgées de plus de 65 ans vivent avec une ou plusieurs maladies chroniques nécessitant souvent de multiples interactions avec différents prestataires, ce qui les rend plus vulnérables a des soins de moins mauvaise qualité et fragmentés. La plupart des pays ont pour objectif de faire en sorte que les systèmes de santé soient centrés sur les personnes. Cela nécessite des systèmes intégrés capables de fournir des soins de santé continus, coordonnés et de haute qualité tout au long de la vie. Malgré des expériences prometteuses, principalement au niveau local, de modèles de soins intégrés, les systèmes restent fragmentés, axés sur les soins aigus épisodiques et inadaptés à la résolution de besoins de santé complexes.

La réalisation de comparaisons internationales valables des avantages des soins intégrés reste difficile en raison du manque d'indicateurs d'intégration des soins techniquement solides et pertinents pour les politiques. Ce rapport présente l'état de l'art sur les meilleures pratiques nationales de mesure de la performance des soins intégrés et fournit les résultats et les leçons du premier pilote de l'OCDE sur les soins intégrés entrepris en 2020-2021 pour soutenir les comparaisons internationales de la prestation de soins intégrés, publié dans *Health at a Glance* 2021.

Le rapport fournit cinq messages clés :

1. Lors de l'examen des **meilleures pratiques nationales**, les pays collectent un volume croissant de données mais l'absence de couplage systématique des données au niveau des patients compromet la valeur des données pour la mesure des performances en matière de soins intégrés. Pour signaler les mauvaises performances des systèmes de santé, un tiers des pays de l'OCDE surveille les taux de réadmission et relient les données hospitalières aux registres des décès et à d'autres ensembles de données clés pour suivre les patients après leur hospitalisation. Cependant, d'autres bases de données disponibles dans leurs systèmes de données, qui sont précieuses pour informer la prestation de soins de santé centrés sur le patient, ne sont pas prises en compte et liées.
2. Les **données pilotes de l'OCDE sur les soins intégrés pour la période 2020-2021 couvraient 15 pays** et ont permis de développer une nouvelle génération d'indicateurs. Ces indicateurs sont développés en utilisant des données liées sur la mortalité, les réadmissions et les médicaments prescrits pour les soins après la sortie de l'hôpital chez les patients victimes d'un accident vasculaire cérébral (ischémique et hémorragique) et d'une insuffisance cardiaque congestive (ICC). En utilisant une définition stricte de la cohorte, les données ont été liées au niveau du patient sur une période de six ans afin d'améliorer la comparabilité des profils de patients entre les pays et l'identification de l'occurrence des premiers épisodes d'AVC et d'ICC.
3. Le projet pilote a montré **que la collecte de données est faisable, mais que le couplage restait un défi.** Le pilote a recueilli des données de 15 pays sur la mortalité et les réadmissions

dans l'année qui suit la sortie de l'hôpital. Seuls quatre pays (République tchèque, Danemark, Finlande et Suède) ont fourni des données sur la prescription de médicaments après la sortie de l'hôpital. La plupart des pays ont soumis des données pour la période 2013-2018 et des données stratifiées pour des ventilations par âge et par sexe sur 10 ans, ainsi que des données au niveau des codes CIM-10 relatifs aux AVC.

4. L'analyse des données suggère que **la moyenne de l'OCDE masque d'importantes variations entre les pays** en ce qui concerne les résultats dans l'année qui suit la sortie de l'hôpital. Par exemple, le taux de mortalité moyen de l'OCDE sur une année pour les AVC ischémiques était de 14 %, mais la fourchette allait de 5 % à 25 %. L'analyse des tendances au sein des pays montre une amélioration des résultats. De multiples indicateurs de résultats sont nécessaires pour mesurer les soins intégrés, ce qui bénéficiera de l'augmentation des liens entre les données au niveau du patient individuel. Dans le cadre de cette collecte de données, il est encouragé d'utiliser davantage le couplage de données pour calculer les indicateurs de prescription de médicaments. Les données sur les taux de prescription de médicaments appropriés 12 à 18 mois après la sortie de l'hôpital donnent un aperçu des variations de la qualité de l'intégration entre les soins hospitaliers et communautaires. Les données sur la prescription améliorent également l'interprétation des indicateurs de réadmission et de mortalité.

5. Compte tenu des enseignements tirés du projet pilote, les actions suivantes pourraient améliorer la comparabilité internationale des futures collectes de données : **cesser** la collecte de données sur les indicateurs d'AVC hémorragique et sur la stratification par niveau de code CIM-10 ; **réviser** la liste des médicaments des indicateurs de prescription et les spécifications des données pour limiter les calculs aux cohortes d'âge de 45 ans et plus ; et **modifier** la spécification de l'indicateur de prescription pour l'ICC et utiliser la population spécifique à la maladie de 2018 comme population de référence pour la normalisation. Les prochaines étapes impliquent l'intégration dans la collecte régulière de données de l'OQCH.

- Ce document propose de poursuivre les travaux sur :
  - (1) **étendre le travail sur le développement d'indicateurs** pour les futures collectes de données dans trois directions possibles;
    - (i) ***Élargir*** - en étendant les travaux à d'autres cohortes de patients, d'affections et de maladies - telles que l'asthme, la BPCO, le diabète, la fracture de la hanche ou du genou, les soins du cancer, la santé mentale et les soins de maternité - ou à des personnes vulnérables telles que les personnes âgées ou les personnes souffrant de multimorbidité ;
    - (ii) ***Approfondir*** - en élargissant les travaux pour prendre en compte des trajectoires de soins plus longues et d'autres liens afin de comprendre les trajectoires des patients dans le système de santé, y compris avant l'hospitalisation, et entre les soins de santé et les services sociaux, ce qui pourrait éclairer l'analyse des modèles de soins pour les personnes vulnérables (par exemple, les résidents de centres de soins de longue durée, les personnes souffrant de troubles mentaux, les personnes défavorisées sur le plan socio-économique) ou l'ensemble de la population ;
    - (iii) ***S'orienter vers d'autres dimensions*** - en élargissant les travaux pour mesurer d'autres dimensions de la performance telles que l'accès, l'utilisation et le coût, par exemple, de nouveaux indicateurs pourraient mesurer l'utilisation et le calendrier des soins primaires et des transitions de soins de/vers l'hôpital vers les soins spécialisés ambulatoires ; la durée moyenne de séjour ou les sorties retardées. D'autres travaux pourraient également consister à utiliser des données liées pour comprendre les variations au niveau sous-national.

- (2) **effectuer une analyse des politiques** pour explorer les variations entre les pays et mieux comprendre les niveaux politiques d'une intégration réussie des soins, y compris les modèles de financement et de gouvernance de la santé ;
- (3) **encourager davantage de pays à améliorer le couplage des données** et à mesurer la prestation de soins intégrés pour des séries chronologiques plus longues afin de soutenir l'analyse des tendances ; et
- (4) **développer de nouvelles mesures du niveau d'intégration des systèmes de santé de l'OCDE centré sur le patient.** Par exemple, en mesurant le nombre de prestataires différents consultés en un an par un patient ayant des besoins de santé spécifiques.

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List of acronyms / abbreviations

AMI	Acute Myocardial Infarction
ATC	Anatomical Therapeutic Chemical
CABG	Coronary artery bypass graft surgery
COPD	Chronic Obstructive Pulmonary Disease
CHF	Congestive Heart Failure
HCQO	Health Care Quality and Outcomes
HFrEF	Heart Failure with reduced Ejection Fraction
ICCONIC	the International Collaborative on Costs, Outcomes, and Needs in Care
ICD	International Classification of Diseases
IHD	Ischaemic Heart Disease
LTC	Long Term Care
P4P	Pay-for-performance
PCI	Percutaneous coronary intervention
PCP	Primary Care Physicians
PDx	Primary Diagnosis
PROM	Patient-Reported Outcome Measures
PREM	Patient-Reported Experience Measures
OECD	Organisation for Economic Cooperation and Development
STEMI	ST-Elevated Myocardial Infarction
THA	Total Hip Arthroplasty
TNA	Total Knee Arthroplasty
WHO	World Health Organisation

OECD Country ISO codes

AUS	Australia
AUT	Austria
BEL	Belgium
CAN	Canada
CHL	Chile
COL	Colombia
CRI	Costa Rica
CZE	Czech Republic
DNK	Denmark
EST	Estonia
FIN	Finland
FRA	France
DEU	Germany
GRC	Greece
HUN	Hungary
ISL	Iceland
IRL	Ireland
ISR	Israel
ITA	Italy
JPN	Japan
KOR	Korea
LUX	Luxembourg
MEX	Mexico
NLD	Netherlands
NZL	New Zealand
NOR	Norway
POL	Poland
PRT	Portugal
SGP	Singapore
SVK	Slovak Republic
SVN	Slovenia
ESP	Spain
SWE	Sweden

CHE	Switzerland
TUR	Turkey
GBR	United Kingdom
USA	United States

1. Why measuring integrated care is increasingly needed to inform policy

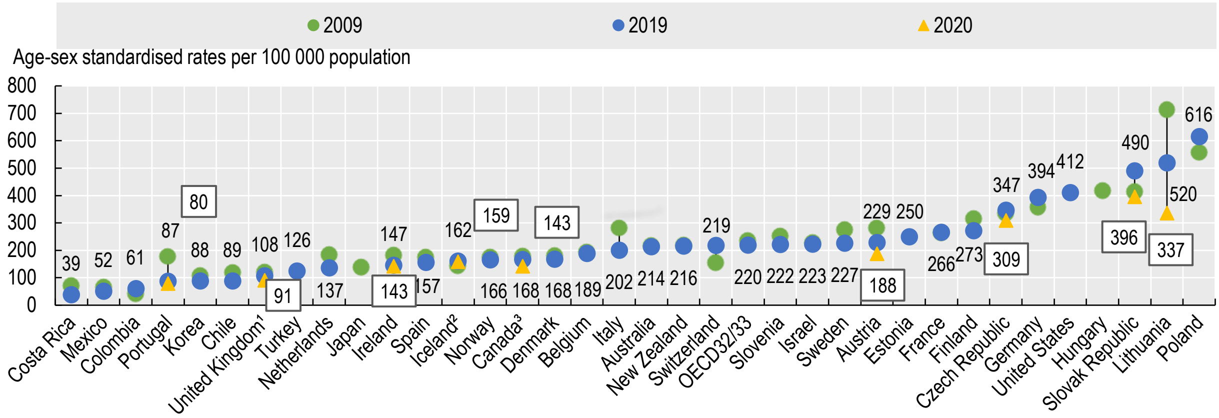
1. Across OECD countries, aging populations and increasing numbers of people with chronic conditions shift the focus of service delivery beyond acute hospital care. The share of the population aged 65 years and over is expected to rise from 17.5% in 2020 to 20.9% by 2030 (OECD, 2021[1]). Almost two in three people aged over 65 years live with one or more chronic conditions (OECD, 2019[2]). People with complex health care needs often require multiple treatment regimens and interactions with different providers, making them more susceptible to poor care quality, poor health outcomes, and poor experiences of care as a result of fragmentation. The past decades have seen many initiatives across OECD countries aiming for "*integrated care*" to ensure individuals have access to the *right care, in the right place, at the right time,* but organisational and financing structures appear to hamper their success (OECD, 2017[3]). The calls for health systems to be more people-centred has further fuelled the requirement for evidence on what policies work best for systems to deliver seamless care (OECD, 2021[4]).

1.1. Systems remain fragmented when delivering health care

2. Despite promising, mostly local-level, experiences of integrated care models, systems remain fragmented, focused on episodic acute care and unsuitable to solve complex health needs. Recent OECD work flags how poor care integration undermines the realisation of the full potential of primary health care (OECD, 2020[5]) A key aim of primary care is to keep people well when living with chronic conditions, by preventing complications and providing effective management including co-ordination of care delivery with other specialists and hospitals when appropriate, while avoiding unnecessary hospitalisations and other low value care (OECD, 2017[6]).

3. Even so, coordination of care across OECD health systems remains challenging. High rates of hospitalisations of patients living with chronic conditions could signal that systems fail to act in delivering seamless care. Recent data shows large cross-country variation in avoidable admissions for prevalent long term conditions like asthma, chronic obstructive pulmonary disease (COPD) and congestive heart failure (CHF) over the past decade (OECD, 2021[7]) (see numbers for CHF in Figure 1.1). However, high rates of hospitalisations may also suggest health systems are failing to deliver effective prevention in the community, as suggested by a review of 29 studies (Ogilvie et al., 2010[8]). Also, in 2019, data from the Commonwealth Fund survey for Primary Care Physicians (PCP) showed that hospitals fail to notify primary health care about patient emergency admissions in up to 86% of the cases (Doty et al., 2020[9]) and fail to send critical clinical information within 48 hours after discharge in up to 88% of the cases, a situation that has worsened since 2012 (Figure 1.2). People with complex health needs are amongst the most frequent hospital visitors and greatly affected by poor care coordination across settings (Wammes et al., 2018[10]).

Figure 1.1. Congestive heart failure hospitalisations in adults, 2009, 2019 (or nearest year) and 2020



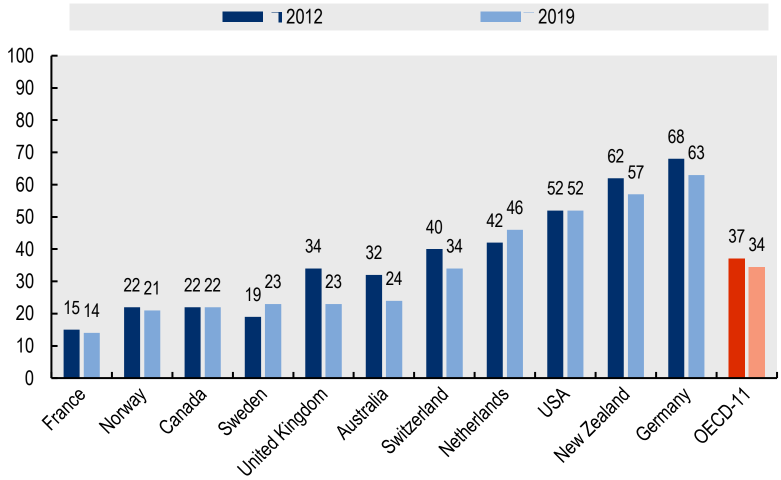
Note: 2020 data labels are shown in boxes. 1. 2020 data are provisional and include England only. 2. Three-year average. 3. 2020 estimate based on provisional 1 April to 30 September data from all jurisdictions except Quebec.
Source: OECD Health Statistics 2021.

4. Poor coordination is also reported between health and social care. Prior OECD work on dementia (OECD, 2018[11]), cancer care (OECD, 2013[12]) and cardiovascular diseases (OECD, 2015[13]) identified the need to solve care fragmentation across and between health and social care (OECD, 2020[14]). In 2019, between 36% and 88% of the PCP in 11 OECD countries reported not coordinating care frequently with social services or other community care services (Doty et al., 2020[9]). Evidence shows that poor post-discharge care after hip fracture, stroke or heart attack in the US (Picone, Mark Wilson and Chou, 2003[15]) and weak provision of long-term care in Norway and in the UK are associated with delayed discharges (Fernandez and Forder, 2008[16]; Gaughan et al., 2017[17]; Holmås et al., 2010[18]).

5. The COVID-19 pandemic has only amplified the need for various providers to deliver seamless care (OECD, 2020[19]; OECD, 2020[20]; OECD, 2020[21]). Siloed information systems undermine sharing of information across providers hampering the right information reaching the right person at the right time. Fragmented care models limit the possibilities to proactively protect vulnerable patients even before they are infected and undermine the provision of social support or personal care services to people in need or at risk. Inadequate skills and workforce mix impede continuity of care and misaligned financial incentives hinder the cooperation needed across various providers and settings.

Figure 1.2. Poor care co-ordination in selected OECD countries, 2012 and 2019

Percentage of Primary Care Physicians receiving patients' clinical information within 48 hours following discharge.



Note: Nationally representative random samples of practicing PCP drawn from government or private lists of PCP in each country except France. Unweighted average is used to calculate the OECD-11 average.
Source: Commonwealth Fund International Health Policy Survey of Primary Care Physicians 2012 and 2019 (Doty et al., 2020[9]).

1.2. Weak evidence restricts effective policy action on integrated care

6. Despite care integration being considered a cornerstone of the policy response in many OECD countries, more efforts to better integrate care across and between health and social care are needed to tackle fragmentation, care duplication and ineffective care delivery (Damery, Flanagan and Combes, 2016[22]; Glasby, 2017[23]; Amelung et al., 2017[24]; Colla et al., 2016[25]; Goddard and Mason, 2017[26]). Lessons learnt from 15 OECD reviews of care quality identified key issues for health systems to improve integrated care, such as the need to strengthen governance models, adequately develop strong information systems and workforce and better use financial incentives (OECD, 2017[3]). These lessons support the findings of various integrated care programmes for multi-morbidity in eight European countries using the WHO evaluation framework (WHO, 2016[27]; Leijten et al., 2018[28]).

7. Although the literature in this topic is vast, evidence remains unclear to help inform effective policy action on integrated care. Lack of internationally comparable data not only undermines international benchmarking but also makes it difficult to assess the cost-effectiveness of interventions aimed at the integration of care. This is partly because interpretation and generalisation of the evidence from local interventions is difficult due to the wide variation in the meaning and application of "integrated care" (see 5. Annex A for a rapid review). With various levels of integration of organisational structures and services, evidence shows that full integration, including health financing, may fail to deliver better quality and integrated patient care (Fisher et al., 2020[29]; Mehrotra, Epstein and Rosenthal, 2006[30]; Kumpunen et al., 2020[31]). Integrated care models have varied in their scope. Early models of integrated care focused on single disease management with a predominately case management approach (WHO, 2016[27]; Stokes, Checkland and Kristensen, 2016[32]). Evidence on the impact is mixed, with improved patient satisfaction but modest effects on outcomes, care utilisation, mortality or spending (Baxter et al., 2018[33]; Stokes et al., 2015[34]; Martínez-González et al., 2014[35]). Results from mostly local-level experiences suggest some effects like better access, improved satisfaction for patients and workforce, reduced hospital utilisation such as (re)admissions rates, emergency visits, and delayed admissions to institutional care, and improved quality of life and preventive care (Nolte and Pitchforth, 2014[36]; Curry and Ham, 2010[37]).

8. More recently, integrated care has evolved towards population-based models with a focus on chronic disease management and prevention-based approaches (Alderwick, Ham and Buck, 2015[38]). There have been well-known successes using this approach, for example, Kaiser Permanente in the US (Pines et al., 2015[39]), spawning a movement towards Accountable Care Organisations (ACO) (Alderwick et al., 2018[40]). However, it is unclear if the ACO findings can be translated to other OECD countries (McWilliams et al., 2016[41]). Gesundes Kinzigtal in Germany is one of the best-known examples in Europe. Evidence suggests this model is reducing mortality rates and improving people's experience of care. There have also been efficiency gains with a slowing rise in spending for the population it serves. Between 2006 and 2010, it generated a saving of 16.9 per cent partly thanks to reduction of emergency hospital admissions (Gesundes Kinzigtal GmbH, 2020[42]). Still, it has proven difficult to study the application of this model to other health systems due to its unique setting for inhabitants of the Kinzigtal region in south-western Germany (Busse and Stahl, 2014[43]). More recently, the English NHS is partnering with local governments to create integrated care systems aimed at preventing disease and reducing emergency hospital care, with early evidence showing small benefits in the short run (The Health Foundation, 2022[44]).

9. The International Collaborative on Costs, Outcomes, and Needs in Care (ICCONIC) initiative also emphasises the lack of high-quality data that allows linking patient data across the health system to support international comparisons. They compare health care utilisation and costs for high-need, high-cost individuals including those with multiple chronic conditions in 11 OECD countries across the trajectory of health care (Papanicolas and Figueroa, 2021[45]). The results show wide variation in outcomes, utilisation and costs and alert for potential differences resulting from various coding practices and missing data on utilisation, including data on rehabilitation (Figueroa et al., 2021[46]) and highlight the importance and difficultly of comparing "like with like" in international comparisons (Street and Smith, 2021[47]).

1.3. Better data is needed and the OECD is piloting its collection

10. Integrated care is a core principle of people-centred health systems associated with empowering people as partners in their own care and improving people's experiences with integration and coordination of their care (OECD, 2021[48]; Amelung et al., 2017[24]). This is highlighted in the OECD Framework and Scorecard for People-Centred Health Systems which responds to the calls by OECD Ministers of Health for building more people-centred health systems (OECD, 2021[4]).

11. Since *Integrated Care* is one of the critical dimensions of people-centred health systems and responsive to deliver high-quality care (Carinci et al., 2015[49]), the OECD Health Committee[1] in December 2019 endorsed further work on *a new generation* of integrated care indicators. Currently, there is lack of internationally comparable data on the processes, outputs and outcomes of integrated care delivery that undermines the policy debate on *which models best deliver improved health outcomes.* While the OECD collects internationally comparable data on indicators to report cross-country differences in health care access, activity, quality and outcomes (OECD, 2021[7]) it does not routinely collect indicators that are designed to specifically measure the quality and outcomes of integrated care delivery.

12. This paper presents results of the first pilot of a *new generation* of integrated care indicators that leverages on linkage of personal health data to support international comparisons of OECD health systems' performance in delivering integrated care. This work consisted of two parts: (1) a review of the national best practices in performance measurement of integrated care; and (2) a readiness study of national health data systems to collect methodologically sound internationally comparable data on performance of integrated care delivery across OECD countries. The paper is organised as follows. Section 2. reviews national best practices in performance measurement of integrated care and presents the OECD Pilot Data Collection on Integrated Care 2020-2021. Section 3. discusses the results of the pilot

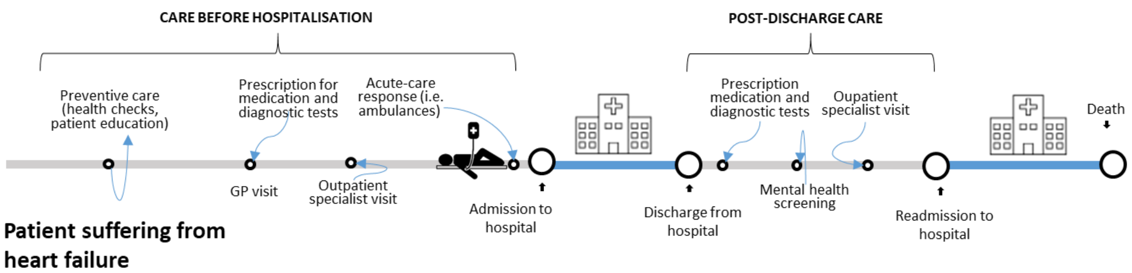
[1] The OECD Health Committee is the governing body of the OECD composed of country officials and overseeing the overall work of the Health Division.

published in *Health at A Glance 2021* as well as additional analyses to assess the feasibility and usefulness of the data collected to inform policy. Section 4. proposes next steps for this work. A Supplementary Analysis is available to complement this publication as well as the 2020-2021 OECD Data Collection Guidelines supporting the pilot data collection.

2. National best practices underlay the OECD Pilot on integrated care

13. In 2017, the OECD Council Recommendation on Health Data Governance (OECD, 2017[50]) called for countries to seize "opportunities to use [their] health data for improving health care quality, surveillance, health system management and research". Recent OECD work sheds light on how the linkage of electronic health records (EHR) across providers and care settings produces better data for monitoring quality and efficiency of health care systems (OECD, 2019[51]). For example, it is possible to link processes of care delivery (e.g. surgical interventions, diagnostic procedures and medication, and the level of coordination between different care services) to outcomes (e.g. disease progression, complications, readmissions or mortality) for a given individual. This is shown for a patient suffering from heart failure in Figure 2.1.

Figure 2.1. Care trajectory across the health care system of a patient suffering from heart failure



Source: Authors' adapted from Sund and Häkkinen in (Cylus J, Papanicolas I and Smith PC, 2016[52]).

14. Section 2.1 provides a review of national best practices in performance measurement of integrated care. Section 2.2 presents the OECD Pilot Data Collection on Integrated Care 2020-2021. The review of national best practices underlay the decisions made regarding the scope and types of indicators composing the OECD Pilot on Integrated Care 2020-2021. As detailed in Section 2.2, the main focus of this pilot is to measure the quality of integration between hospital and community care one year after discharge i.e. the post-discharge care pathway as shown in Figure 2.1. However, variations in post-discharge care may result from variations in health care access and utilisation prior to hospitalisation. Examples include differences in access to primary care, specialist care, and use of primary prevention strategies.

2.1. Countries collect a growing volume of data but a lack of linkage undermines its value

15. The OECD National Health Data Infrastructure and Governance Survey conducted in 2020-21 (Oderkirk, 2021[53]) shows considerable variation in both the availability and readiness of key data sets, and their regular linkage, for the purpose of monitoring, statistics and research (Figure 2.2). **Denmark**, **Finland, Canada**, **Sweden** and the **Netherlands** claim to use data linkage in at least 80% of their databases for quality monitoring of health systems, while 12 out of the 23 respondent countries claim to

not use data linkage at all or in less than 60% of their databases for the same purpose. Seven out of 23 respondent countries (**Czech Republic**, **Finland**, **Israel**, **Korea**, **Norway**, **Singapore**, and **Sweden**) use patient identifiers to link data in more than 90% of the national datasets while 16 countries use sets of other variables (e.g. patient sex or birth date) to link data (Oderkirk, 2021[53]). Countries identify several institutional barriers, including poor institutional arrangements and governance models, as undermining the linkage and sharing of data among public authorities.

Figure 2.2. Countries show variations in linking health, contextual and outcomes data

Multiple health care settings	AUS	BEL	CAN	DEN	FIN	FRA	ISR	KOR	LVA	NLD	NOR	SGP	SVN	USA	14
Disease registries to mortality data	AUS	AUT	CAN	CZE	EST	FIN	ISR	JPN	KOR	LVA	LUX	SGP	SVN	SWE	14
Health care to mortality data	AUS	AUT	CZE	FIN	ISR	KOR	LVA	NLD	SVN	USA	10				
Population census to disease registry data	CAN	EST	FIN	LVA	NLD	SVN	SWE	7							
Population census to health care data	AUS	CAN	FIN	NLD	SVN	SWE	6								
Cancer registry to health care data	BEL	CZE	LVA	NLD	SWE	5									
Population health survey to health care data	FIN	SWE	USA	3											
Cancer registry to cancer screening data	LUX	SVN	2												
Health care to personal income tax data	AUS	NLD	2												
Population health survey to social insurance data (social security)	SWE	USA	2												
Population health survey to Population census data	NLD	SWE	2												

Source: (Oderkirk, 2021[53])

16. Data linkage was undertaken mainly with four datasets: hospital inpatient data, mental hospital inpatient data, mortality data, and cancer registry data. Nineteen out of the 23 countries answering the OECD survey (Oderkirk, 2021[53]) report have had national projects in the last five years involving innovative uses to link personal health data. These projects mainly focus on five areas: (i) patient safety, inappropriate use of medication and adverse drug events; (ii) stroke care; (iii) mental health care and psychiatric hospitalisation; (iv) cancer; and (v) perinatal care.

17. Some countries make use of data linkage to follow up patients across care pathways. The authors performed semi-structured interviews with some country delegations of the OECD Working Party for HCQO[2] (WP-HCQO), including Australia, Estonia, Finland, Israel, Japan, Netherlands, Slovak Republic, Singapore, Sweden, and the United Kingdom. Results from these consultations show several countries use data linkage to monitor performance of health systems in delivering integrated care after hospitalisation. To do so, countries use three types of indicators presented in Figure 2.3:

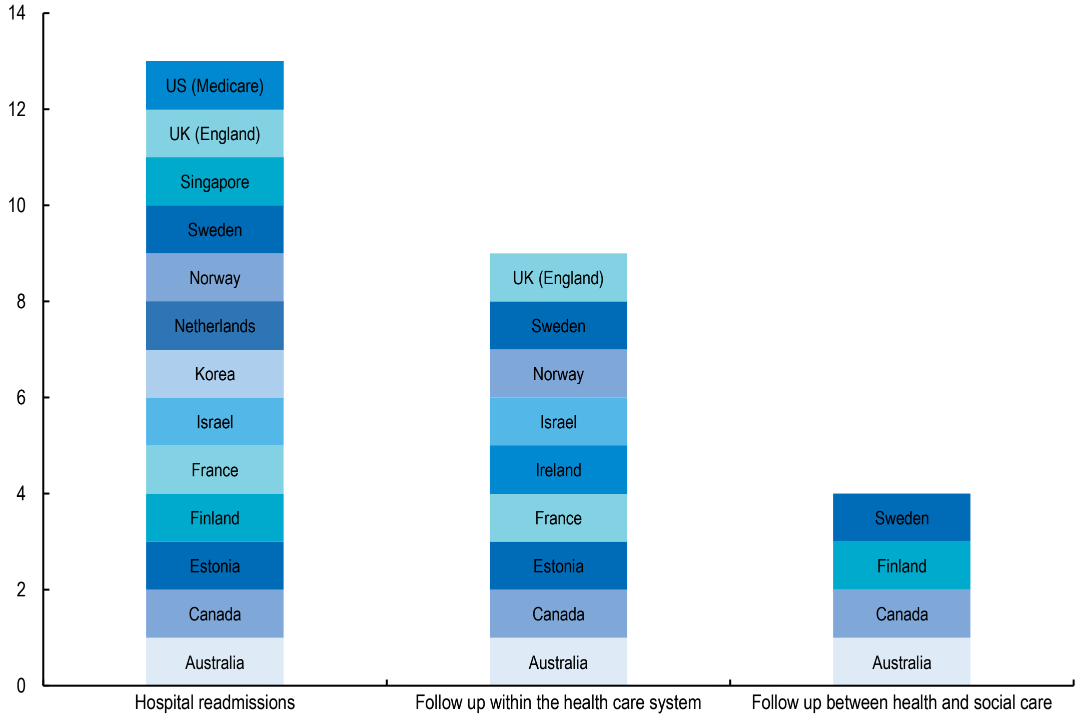
- (1) indicators on **hospital readmissions** are used by many countries (see details in Table 2.1); these are often calculated using patient-linked hospital in-patient data (or emergency care) to mortality datasets; however, some countries (e.g. Israel) also use hospital-based ambulatory care, mental health care, and clinical registries;
- (2) indicators that **follow up patients within the health system** are used less often by some countries (see details in Table 2.2) to link patient-level data across various datasets, including

[2] Working Party for Health Care Quality and Outcomes (WP-HCQO) is composed of delegates from OECD member countries and overseeing the OECD's work regarding Health Care Quality and Outcomes.

hospital care, ambulatory care, mental hospital in-patient care, prescribing data, mortality data, clinical registries data, and patient-reported outcomes; and

- (3) indicators that **follow up patients between health and social care** are used by a few countries (see details in Table 2.3) to link patient level across health datasets to social care datasets including long-term care, schooling data, and socioeconomic data.

Figure 2.3. Three types of indicators used to measure integrated care



Source: Authors based on consultations with country delegates of the OECD HCQO Working Party and (Oderkirk, 2021[53]).

Several countries monitor readmission rates to signal poor health systems performance

18. The revolving door syndrome in hospitals has been documented in the US health system (Goodman, Fisher and Chang, 2013[54]) and more broadly across OECD countries (Berchet, 2015[55]). Patients unexpectedly return to hospital due to a number of factors, including a growing burden of chronic conditions requiring resource-intensive disease management that commonly take place in hospitals, insufficient access to primary care services, and a lack of social support associated with socioeconomic deprivation. Countries use readmission indicators which can link hospital in-patient and emergency care data at patient level and are defined by various time windows (e.g. 1 year, 90 days, 30 days, 72 hours). Table 2.1 lists two types of (unplanned) readmission indicators commonly used across countries:

- (1) Readmission indicators for general population or broad patient groups, also referred as **all-cause readmission indicators**; and
- (2) Readmission indicators for people with a **specific condition or disease**.

19. Readmission indicators for the general population or broad patient groups not associated with a specific disease or complication have been used as sentinel events to signal gaps in post- discharge care quality as well as failures in care coordination. Several countries (e.g. **Australia**, **Canada**, **Israel**,

Netherlands and **Singapore**) monitor hospital readmission rates irrespective of the cause of readmission. Moreover, some countries (e.g. **Canada**, **UK (England)**, **USA (Medicare)**) use all-cause readmission rates after an acute event like Acute Myocardial Infarction (AMI), stroke, and given cardiac interventions (e.g. percutaneous coronary intervention (PCI), coronary artery bypass graft surgery (CABG)) or even after elective care such as primary total hip arthroplasty (THA) and/or total knee arthroplasty. Also, **Norway** monitors 30-day readmission rates for older patients.

20. Readmission indicators for people with a specific condition or disease relate to certain patient cohorts and specific conditions that cause the hospital readmission. **Australia** uses 30-day readmission rates for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after a patient visits hospital for a number of conditions including AMI, ischaemic stroke, pneumonia, hip fracture and CHF. **Canada, Estonia, Israel, Finland** and **Korea** use readmission rates for mental health disorders to signal failures in coordinating mental health care across the system. **France** and **Sweden** use readmission rates after AMI and stroke within 365 days after hospital discharge. **Norway, Sweden** and **Singapore** use 30-day and 90-day readmission rates after discharge caused by CHF.

Table 2.1. Types of hospital readmission indicators used across countries

(1) Readmission Indicators for general population or broad patient groups	(2) Readmissions Indicators for people with a specific condition or disease
All-cause unplanned hospital readmissions within 28 days (AUS) 7-day all-cause unplanned readmission rates for hospital patients (ISR) 30-day all-cause unplanned readmission rates for hospital patients (NLD, ISR)	***AMI:*** Hospital readmission after AMI within 30 days (CAN) Hospital readmissions after AMI within 365 days (FRA, SWE) Recurrent AMI or death from Ischaemic Heart Disease (IHD) in 365 days (SWE) 30-day readmissions for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after AMI (AUS)
30-day readmission for hospital patients (SGP)	***Stroke:*** Hospital readmissions after stroke within 365 days (FRA, SWE), 30-day (NOR) 30-day readmissions for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after ischaemic stroke (AUS)
All-cause return to emergency care within 24 hour, 48 hour, and 30 days (ISR) All-cause return to emergency care within 72h (SGP)	***Congestive Heart Failure:*** 30-day CHF readmission rate (NOR) 30-day, 90-day CHF readmission rate (SWE, SGP) 30-day readmissions for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after CHF (AUS)
30-day all-cause readmission rates of patients 67 years and older (NOR)	***Pneumonia:*** 30-day readmission rate (NOR) 30-day readmissions for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after pneumonia (AUS)
	Hip fracture: Recurrent hip fractures (& death) within 1 year (SWE) 30-day readmission (NOR) 30-day readmissions for complications (e.g. sepsis, urinary tract infection, fracture of neck or femur) after hip fracture (AUS)
	Asthma/COPD: 90-day readmission due to COPD complications (FRA) 30-day readmission due to asthma/COPD (NOR)
	Mental health: 30-day hospital readmission for patients with mental health disease (CAN) 30-day and 180-day readmission to psychiatric ward (ISR) 30-day readmission for schizophrenia (EST, KOR, FIN) or bipolar disease (FIN)

Source: Authors based on consultations with country delegates of the OECD HCQO Working Party and members of the Expert Group for Integrated Care, as well as (Australian Institute of Health and Welfare, 2021[56]; CIHI, 2021[57]; Habicht et al., 2018[58]; Haigekassa, 2021[59]; Keskimäki et al., 2019[60]; Kroneman et al., 2016[61]; Jonsson, Pikkujämsä and Heiliö, 2019[62]; Oderkirk, 2021[53])

Some countries link hospital data to other key data to follow up patients before and after hospitalisation

21. Some countries are investing heavily in linking hospital data to other key health data (including clinical registries, prescribing data, and primary and other outpatient care data) in an effort to follow patients before and after hospitalisation. Countries currently monitor three types of care transitions listed in Table 2.2: (1) transition between acute care outside hospital and inpatient care; (2) transition between hospital and post-discharge medicine prescribing; and (3) transition between hospital and outpatient care for a number of conditions, including AMI, stroke, CHF and mental health. For example, **France** and **Israel** monitor transmission of ambulance activity before arrival at the hospital in cases of suspected AMI. **Estonia**, **France** and **Sweden** monitor prescription of effective secondary prevention after stroke, AMI, CHF or psychosis. **Estonia** uses referral rates for stroke patients to rehabilitation after discharge to monitor coordination between hospital and outpatient care (ICES, 2019[63]).

22. Moreover, a few countries are integrating information from patient perspectives in providing quality health care, namely patient reported outcomes and experiences (PROMs and PREMs). **Australia's** Coordination of Health Care Study is linking patients' reported experience data from 125,000 individuals with administrative data on health care utilisation and uptake of pharmaceuticals 12–24 months before and after the date of the survey. Also, **Singapore** is preparing a two-year survey pilot for Total Knee and Hip Replacement Surgery using Oxford Knee score, Oxford Hip Score and EQ-5D-5L tools to track PROMs in alignment with the PaRIS initiative[3] (OECD, 2021[7]), and a number of cluster survey pilots to capture patients' experiences, under the War on Diabetes national initiative.

Table 2.2. Examples of indicators used by countries that link various data sets to follow patients within the health care system

Types of care transitions	Before hospitalization	After hospitalisation
(1) Transition between acute care outside hospital and inpatient care	***AMI:*** ● Transmitting ECG results from the ambulance before arrival at the hospital in cases of suspected AMI (type STEMI) (FRA, ISR) ● Aspirin by the ambulance crew at the very beginning of an AMI (ISR) ***Stroke:*** ● Patients with ischaemic stroke- "Door-to-computed tomography" (EST)	
(2) Transition between hospital and post-discharge medicine prescribing		***AMI:*** ● Appropriate drug prescribing among patients after AMI (FRA, SWE) ***Stroke:*** ● Appropriate drug prescribing >1yr after acute stroke (EST, SWE) ***Congestive Heart Failure:*** ● Appropriate drug prescribing to persons with CHF (SWE) ***Mental Health:*** ● Out-of-hospital antipsychotic treatment (EST)

[3] **PaRIS is the OECD's Patient-Reported Indicator Surveys** initiative where countries work together on developing, standardising and implementing a new generation of indicators that measure the outcomes and experiences of health care that matter most to people. For more information, please visit : https://www.oecd.org/health/paris/

(3) Transition between hospital and outpatient care		***Stroke:*** ● Post-discharge visits after stroke (EST) ● Rehabilitation within 1-month after stroke discharge (EST) ● Referral to rehabilitation after stroke (EST) ***Congestive Heart Failure:*** ● No. of Emergency Department Visits after CHF (SGP) ***Mental Health:*** ● New schizophrenia patient`s first ambulatory visit within 30 days after discharge (EST) **Not condition-specific:** ● Elderly people (aged 65+ years) which are followed by a contact with a general practitioner within one week after hospital discharge (BEL) ● Delayed discharge measured by the number of days patients spend in hospital when they are clinically considered ready to be discharged (CAN, ILD, IRE, NOR, SWE, UK (England))

Source: Authors based on consultations with country delegates of the OECD HCQO Working Party and members of the Expert Group for Integrated Care, as well as (Australian Institute of Health and Welfare, 2021[56]; CIHI, 2021[57]; Habicht et al., 2018[58]; Haigekassa, 2021[59]; Keskimäki et al., 2019[60]; Kroneman et al., 2016[61]; Jonsson, Pikkujämsä and Heiliö, 2019[62]; Oderkirk, 2021[53]).

A few countries pioneer linkage between health, social care and other sorts of data

23. Only a few countries are pioneering integration of health data with social care and other categories of data at the individual level to follow up two cohorts: (1) early life and (2) long-term care residents (see Table 2.3). For example, **Australia** is pioneering integration of data from health, education and social services to assess early development interventions, following up a cohort of individuals from their birth to school ages and linking information with their parents and communities (Murdoch Children's Research Institute, 2019[64]). **Sweden** is monitoring hospital readmissions and inappropriate use of medication (such as long-acting benzodiazepines or drugs with significant anticholinergic effects) by older people living in long-term care institutions. Moreover, the **United Kingdom (England)** is trialling a national programme of Integrated Care and Support Pioneers across 25 sites to coordinate care between acute, primary, secondary and social care services looking at various indicators including delayed transfers of care from hospital attributable to adult social care (Raleigh et al., 2014[65]).

Table 2.3. Examples of indicators used by countries that link health and social care data sets

Cohorts	Indicators	Care settings
(1) Early Life	● Health and education outcomes of children and their parents (AUS)	Health care system, education and social services
(2) Long-term care residents	● Older people in LTC with prescribed drugs that should be avoided (SWE) ● Hospital readmissions among elderly in LTC (SWE) ● Delayed transfers of care from hospital attributable to adult social care (UK(England))	Health care system and LTC and social care services

Source: Authors based on consultations with the OECD HCQO Working Party and members of the Expert Group for Integrated Care.

2.2. The OECD Pilot Data Collection on Integrated Care in 2020-2021

24. The pilot occurred in 2020-2021 simultaneously with the regular OECD HCQO data collection and is the result of joint work of the OECD Secretariat and the OECD HCQO Working Party. Details of the supporting materials (including the pilot data collection guidelines with indicator definitions, ad hoc questionnaire Sources and Methods, and interview guide for expert interviews) can be found in the Data Collection Guidelines provided as a complementary document to this paper. To supervise the technical aspects, an ad hoc OECD Expert Group on Integrated Care was established in January 2020 composed of 80 representatives from 20 countries (Australia, Canada, Costa Rica, Denmark, Estonia, Finland, France, Germany, Israel, Italy, Japan, Netherlands, Norway, Portugal, Singapore, Slovenia, Sweden, Turkey, United Kingdom, United States). The OECD Expert group includes clinicians, government officials, experts on quality measurement, national statistics and data governance bodies, and academic researchers leading international work in this area (more details in Annex B).

25. The Expert Group met seven times during 2020-2021 to define the conceptual framework, scope and methodological definitions for the pilot while the OECD HCQO Working Party validated the decisions to implement the pilot. The pilot followed conceptually the OECD Framework for Health System Performance (Carinci et al., 2015[49]) and built on the national best practices reviewed in Section 2.1 and past OECD work on hospital performance for AMI and stroke (Padget, 2019[66]). The national best practices presented in Section 2.1. relate to countries that focus on monitoring care delivery after hospitalisation, using readmission rates and medicine prescribing rates after hospitalisation to signal poor health systems performance for AMI, stroke, CHF and mental health. The Expert Group reflected on these lessons to define the scope and set of indicators to be piloted.

The scope: quality of integration between hospital and community care one year after discharge

26. The scope of the pilot focussed on care delivery one year after hospitalisation and the final set of 19 piloted indicators is presented in Table 2.4. Indicators such as mortality, readmissions and medication prescriptions after hospitalisation provide insight into the quality of integration between hospital and community care. This set included three types of indicators for people suffering from stroke and CHF:

- (1) All-cause and disease-specific hospital readmissions;
- (2) All-cause mortality after hospital discharge; and
- (3) Prescription of appropriate medication for secondary prevention after hospital discharge.

27. The set of piloted indicators included initially six indicators (3 stroke and 3 CHF). These were extended to nine indicators in order to differentiate between ischaemic and haemorrhagic strokes, given the differences in epidemiology, prognosis and approaches to disease management. Finally, the Expert Group considered proposals offered by Sweden to inform policy action (Box 2.1). Included in the final set of indicators to pilot were four additional indicators which combined readmission or all-cause mortality rates (i.e., IC3a, IC3b, IC7a and IC7b and as exemplified in Figure 2.4), three additional medicine prescribing indicators (i.e., IC4, IC8 and IC12) and 30-day case fatality for CHF (IC13).

Table 2.4. Set of 19 indicators part of the OECD Pilot Data Collection on Integrated Care 2020-2021

Type of indicator	Linked datasets	Stroke (Ischaemic/Haemorrhagic) (Indicator number: indicator name)	Congestive Heart Failure (Indicator number: indicator name)
(1) Hospital readmissions	Hospital in-patient and emergency data, death registries	Ischaemic Stroke IC1a: Ischaemic Stroke - All-cause hospital readmissions within 365 days after discharge IC1b: Ischaemic Stroke - Disease-specific hospital readmissions within 365 days after discharge Haemorrhagic Stroke IC5a: Haemorrhagic stroke – All-cause hospital readmissions within 365 days after discharge IC5b: Haemorrhagic stroke – Disease-specific hospital readmissions within 365 days after discharge	IC9a: CHF - All-cause hospital readmissions within 365 days after discharge IC9b: CHF - Disease-specific hospital readmissions within 365 days after discharge
(2) Mortality after hospital discharge	Hospital in-patient and emergency data, death registries	Ischaemic Stroke IC2: Ischaemic Stroke - All-cause mortality within 365 days after discharge IC3a: Ischaemic Stroke - Mortality or all-cause readmission within 365 days after discharge IC3b: Ischaemic Stroke - Mortality or disease-specific readmission within 365 days after discharge Haemorrhagic Stroke IC6: Haemorrhagic stroke – All-cause mortality within 365 days after discharge IC7a: Haemorrhagic stroke – Mortality or all-cause readmission within 365 days after discharge IC7b: Haemorrhagic stroke – Mortality or disease-specific readmission within 365 days after discharge	IC10: CHF - All-cause mortality within 365 days after discharge IC11a: CHF - Mortality or all-cause readmission within 365 days after discharge IC11b: CHF - Mortality or disease-specific readmission within 365 days after discharge IC13: CHF - Case fatality within 30 days of the admission date
(3) Prescription of appropriate medication for secondary care prevention	Hospital in-patient and emergency data, death registries, pharmaceutical prescribing data	Ischaemic Stroke IC4: Ischaemic Stroke - Prescribed antihypertensive medicines between 12 and 18 months after ischaemic stroke Haemorrhagic Stroke IC8: Haemorrhagic stroke – Prescribed antihypertensive medicines 12-18 months after haemorrhagic stroke.	IC12: CHF - Prescribed medicines between 12 and 18 months after heart failure under Triple Therapy, Double Therapy or Monotherapy

Source: 2020-2021 OECD Pilot Data Collection Guidelines on Integrated Care.

Box 2.1. Sweden proposed to the Expert Group some ideas of indicators to be piloted

Table 2.5. List of suggested indicators

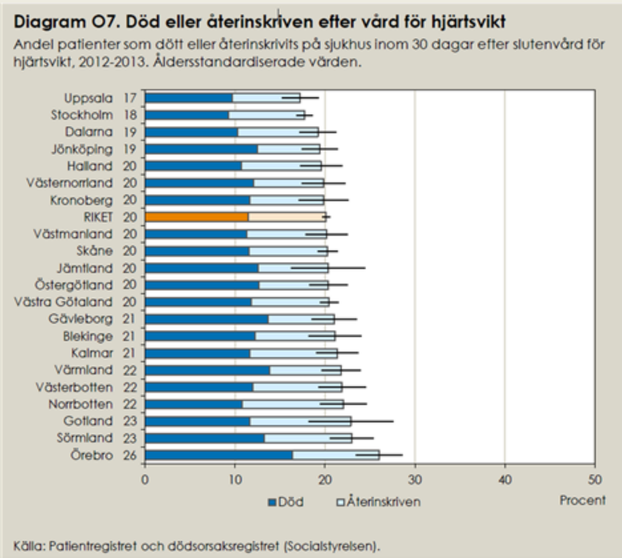
Type of indicator	Indicator names
Readmission indicators	Stroke – readmission after stroke within 365 days AMI – recurrent AMI or death from IHD in 365 days Hip fracture – recurrent hip fractures within 1 year Heart failure readmission in 30 days
Follow up with health care on medicines prescribing	Lipid lowering drug therapy after myocardial infarction Heart failure - prescribed drugs to persons with heart failure Antihypertensive drugs prescribed after stroke
Follow up between health and long term care	Elderly in a long term care institution with prescribed drugs that should avoided Hospital readmissions among elderly in a LTC institution

Source: Members of the Expert Group from Sweden.

Data integration to enable better data at patient level

Sweden uses linkage of key data sets to better determine disease incidence and improve performance measurement. Examples of such data are clinical registries and other administrative registries including specialised outpatient care, hospital care, dispensing medication data, and long-term care. A number of indicators are calculated and publicly published to support performance assessment of regional comparisons of care quality in different care settings. The results from the indicators reflect the combined quality from different care settings. Moreover, Sweden uses combined readmission and all-cause mortality rates to increase policy interpretation of the indicators, for example, the share of patients that die or are readmitted in hospital within 30 days after end of treatment after heart failure are calculated at regional level (Figure 2.4).

Figure 2.4. Heart failure: Death or Readmission in 30 days



Source: Experts from Sweden based upon the Swedish Performance Assessment on Cardiac Care.

Two case studies: stroke and congestive heart failure

28. Stroke and CHF indicators one year following discharge can be calculated using patient-level hospital records linked to death registries and outpatient medicine prescribing data. Evidence is well established for effective prevention and treatment of stroke and CHF, namely on the role played by care placed out of hospital. Care integration between hospitals, specialised outpatient care and primary health care ensures there is no acute deterioration of people living with CHF or stroke by decreasing the risk of severe complications, hospitalisation and death (OECD, 2015[13]). CHF and stroke are widely prevalent conditions causing large disease burden (OECD, 2021[7]). Recent data shows stroke is a leading cause of death, accounting for 7% of deaths across the OECD in 2019 while CHF causes on average 220 admissions per 100 000 people across OECD countries (OECD, 2021[7]). CHF is a serious medical condition; the heart is unable to pump enough blood to meet the body's needs and is often caused by hypertension, diabetes or coronary heart disease. A stroke occurs when the blood supply to the brain is interrupted, leading to necrosis (cell death) of the affected part. Of the two types of stroke, about 77% are ischaemic (caused by clotting) and 23% are haemorrhagic (caused by bleeding) (Feigin et al., 2021[67]).

One long time window of (at least) six years of patient-linked data

29. The linkage of patient level data for at least six years ensured comparability of patient profiles across countries and identification of occurrence of first episodes of stroke and CHF. Indicators were calculated for people aged 15 and over at the day of admission presenting with an acute non-elective (urgent) episode of care for a first-time event of stroke or CHF. A first-time event was defined among people with no disease specific hospital admission in the previous five years i.e. 5-year "washout" period. A first-time ischaemic stroke was defined as an ischaemic stroke with a *primary diagnosis*[4] of ischaemic stroke (defined with ICD-10 codes: I63-I64) from 1 January to 31 December in the specified year among persons with no hospital admission for any type of stroke (ICD-10: I60-I64 and I69) in the previous 5 years. A first-time haemorrhagic stroke was defined as a haemorrhagic stroke (ICD-10: I60-I62) among persons with no hospital admission for any type of stroke (ICD-10: I60-I64 and I69) in the previous 5 years. A first-time episode of care for heart failure is defined as persons with no hospital admission for heart failure (ICD-10: I11.0, I13.0, I13.2, and I50) in the previous 5 years.

30. To make data collection feasible, countries were requested to fulfil four data requirements:

- (1) Unique patient identifier to link different acute hospital inpatient episodes of care by one or multiple providers over time before and after an index hospitalisation[5];
- (2) National data on hospital care with national coverage, including details on types and dates for admission and discharge and coding of diagnoses for at least six years.
- (3) Data linkage to death/population registries with information on age and dates of deaths, including those happening outside the hospital;
- (4) A registry of prescribed medicines or medicine reimbursement claims data with information on ATC codes[6] that can be linked to the persons discharged from hospital.

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[4] **Primary diagnosis (PDx)** follows one of two approaches: a. The PDx is the condition established after early clinical evaluation to be chiefly responsible for causing the hospitalisation (*'condition held chiefly responsible'* approach); b. The PDx is the diagnosis that is finally established to be the main reason for the hospital stay, i.e. demanding the most resources/ over the course of the patients stay (*'condition demanding the most resources'* approach).

[5] **Index hospitalization** refers to the first time, in a series of hospitalisations, that a patient is admitted to a hospital for a specific condition or diagnosis.

[6] See the ATC classification system developed by the WHO Collaborating Centre for Drug Statistics Methodology (WHOCC) available at https://www.whocc.no/atc_ddd_index/. Further details on the classification system can be found here https://www.whocc.no/atc/structure_and_principles/

3. Findings of the OECD Pilot on integrated care for stroke and CHF

31. This Section discusses the main findings of the OECD Pilot Data Collection on Integrated Care 2020-2021 for stroke and CHF. Section 3.1 provides an overview of the data submitted by countries. Section 3.2 extends the results of the pilot published in *Health at A Glance 2021* including a greater number of countries that participated in the pilot as well as additional analyses on haemorrhagic stroke and assessments of the feasibility and usefulness of the pilot data to inform policy. Finally, Section 3.3 reflects on methodological improvements to improve comparability for future work.

3.1. Data collection was feasible but linkage remains a challenge

32. Table 3.1 provides a detailed overview of the data submitted by countries. Fourteen OECD member countries and Singapore submitted data to the pilot. All countries submitted data for indicators requiring data linkage between hospital in-patient, and death registries (i.e. all indicators except IC4, IC8 and IC12). However, only four of 15 countries (Czech Republic, Denmark, Finland and Sweden) submitted data for medicine prescription indicators (i.e. IC4, IC8 and IC12) for which linkage between hospital data and medicine prescription data is required. Most countries reported data calculated retrospectively for the period 2013-2018 and two countries (Japan and Lithuania) provided provisional data for 2020. All countries submitted stratified data for 10-year age and sex breakdowns, while 13 out of 15 countries (except Canada and Slovenia) provided ICD-10 level data to characterise stroke incidence across populations.

Table 3.1. Fifteen countries submitted data to the OECD Pilot Data Collection on Integrated Care 2020-2021

	Canada	Costa Rica	Czech Republic	Denmark	Estonia	Finland	Israel	Italy	Japan	Lithuania	Norway	Singapore	Slovenia	Sweden	UK (Northern Ireland)
INDICATORS															
Ischaemic Stroke (IC1a, 1b, 2, 3a, 3b)	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Haemorrhagic Stroke (IC5a, 5b, 6, 7a, 7b)	X	X	X	X	X	X	X	X	X	X	X	X		X	X
CHF (IC9a, 9b, 10, 11a, 11b)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X[a]
Medicine prescription (IC4, 8, 12)			X[b]	X		X[b]					X				
CHF 30-day mortality (IC13)		X	X	X	X	X	X	X	X	X	X	X		X	
YEARS															
2013		X	X	X		X	X	X	X	X				X	X
2014		X	X	X		X	X	X	X	X				X	
2015		X	X	X		X	X	X	X	X				X	
2016		X	X	X		X	X	X	X	X	X			X	
2017	X	X	X	X		X	X	X	X	X	X	X		X	
2018		X	X	X	X	X	X	X	X	X	X	X	X	X	
2019		X	X[c]	X[d]		X[e]		X[e]	X	X			X	X[d]	
2020		X	X						X[e]	X					
AGE STRATIFICATION	X	X	X	X	X	X[f]	X	X	X	X	X	X	X	X	X
SEX STRATIFICATION	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ICD CODES															
ICD60		X	X	X	X	X	X	X	X	X	X	X		X	X
ICD61		X	X	X	X	X	X	X	X	X	X	X		X	X
ICD62		X	X	X	X	X[g]	X	X	X	X	X	X		X	X
ICD63		X	X	X	X	X	X	X	X	X	X	X		X	X
ICD64		X	X	X	X	X[g]		X	X	X	X	X		X	X
5-YEAR WASHOUT PERIOD	X	X		X	X	X	X	X		X	X	X	X	X	X

Note: [a] Submitted only readmission indicators (IC9a and IC9b). [b] submitted Stroke prescription indicators (IC4 and IC8). [c] Submitted preliminary results for 2019 data. [d] Submitted 2019 data for all indicators except prescription indicators (IC4, IC8, and IC12). [e] Submitted an additional year of data for CHF 30-case fatality indicator (IC13). [f] Due to small sample sizes, only totals were submitted for each year for ICD-10 I62 and ICD-10 I64. [g] Due to small sample sizes, only totals were submitted for each year (stratified by sex but not age group) for ICD-10 I62 and ICD- I64. See indicator definitions in Table 2.4. For details on indicator specifications please see 2020-2021 OECD Pilot Data Collection Guidelines on Integrated Care.

Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

33. Moreover, results from the ad hoc questionnaire on Sources and Methods allowed assessment of the feasibility of compliance with the pilot data requirements (as discussed in Section 2.2). All countries used a unique patient-identifier and provided nationally representative data except Canada, Japan, and the UK (Northern Ireland). Data for Canada is nationally representative except for Quebec and Yukon Territory, which accounts for about 20% of the total population. Data for Japan represents about 30% of hospitals nationwide that are part of a nationally representative hospital network - the Japanese Hospital Association. Data for UK (Northern Ireland) is representative of Northern Ireland but not of the UK.

34. Countries identified patients based on a first-time episode of care requiring a 5-year washout period to identify cases with no previous acute care incident. Two countries did not apply the 5-year washout: Czech Republic (instead using a first event of primary diagnosis in a reference year) and Japan (instead using a one-year washout). All countries applied the follow up period of 365-days after discharge

from an acute non-elective (urgent) episode of care period. All countries used the population of patients aged 15 years and older to calculate the indicators. Nonetheless, definitions of acute urgent care varied across countries. Most countries defined acute urgent care as a hospital admission via emergency/unplanned care (Costa Rica, Finland, Japan, Israel, Italy, Norway, Slovenia and Sweden) or curative care (Lithuania). Some countries (Estonia) excluded acute care related to rehabilitation, psychiatric or LTC, or used diagnosis-related groups (Czech Republic) to identify acute episodes.

35. The ad hoc questionnaire also collected information on data linkage between health and social care. Most countries (except Czech Republic, Estonia, Israel, Slovenia, UK (Northern Ireland)) could link patient admission data to and from long-term facilities, providing possibilities for future work. Slovenia could identify patients discharged to long-term care facilities but could not distinguish whether these were admitted from a long-term care facility. Estonia could only define patients accessing long-term care provided through the health care system (i.e. social care and nursing homes were not included). Israel could not reliably link data to/from long term care facilities and Czech Republic and UK (Northern Ireland) could not link patient admissions to/from long term care.

36. Only four countries (Czech Republic, Denmark, Finland and Sweden) provided medicine prescribing data for stroke patients. Only Denmark and Sweden provided medicine prescribing data for stroke and CHF. Finland submitted data from medicine registries provided by the Social Insurance Institution based on medicine reimbursements. Sweden submitted data from the Swedish Prescribed Drug Register i.e. the official database for prescribed medications. This database includes data for all medications dispensed at pharmacies and updated each month with data from the Swedish eHealth Agency. Some countries (Costa Rica, Israel, Italy, Japan, Lithuania, Singapore) mentioned that medicine prescription data was either not available or could not be linked with other datasets.

3.2. Results published in *Health at a Glance 2021* call for more data and further policy analysis

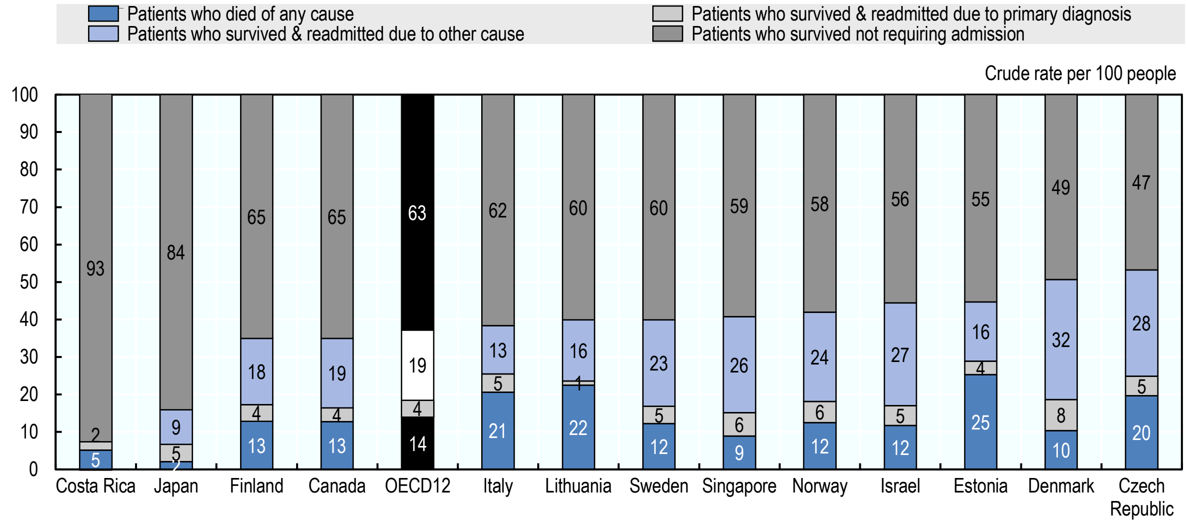
OECD average masks large cross-country variations in outcomes one year after discharge

37. As published in *Health at A Glance 2021* (OECD, 2021, pp. 180-182[7]) Figure 3.1 shows crude rates for mortality, readmissions and survival not requiring readmission after discharge following an ischaemic stroke admission in 2018 across 15 countries (now also including data for Denmark and Singapore). For patients who suffered an ischaemic stroke, on average, 63% survived and did not return to acute care, 23% survived and were readmitted to hospital (4% including a stroke-related admission[7] and 19% for other reasons not including a stroke related admission) and 14% died in the following year.

38. The OECD average masks large cross-country variations. In ischaemic stroke patients, one-year all-cause mortality ranged from 2% in Japan to 25% in Estonia. One-year stroke-related readmissions ranged from 2% in Costa Rica to 8% in Denmark and one-year readmissions for other reasons ranged from 0% in Costa Rica to 32% in Denmark. Patients who survived and were not readmitted to acute care ranged from 93% in Costa Rica to 47% in Czech Republic.

[7] Stroke-related admission: Stroke admissions or admissions for stroke or late effects (sequelae) of stroke

Figure 3.1. Patient outcomes one year after discharge due to ischaemic stroke, crude rates, 2018

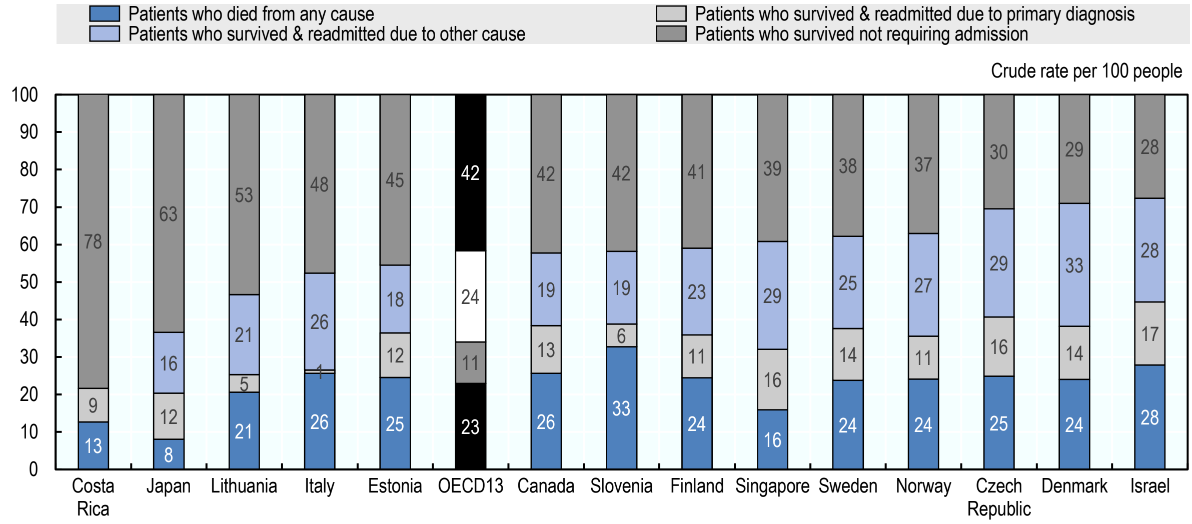


Note: Data for UK (Northern Ireland) was not included because of incomplete indicators. Data for Canada are sourced from 2017. Calculation of percentage of patients who died for any cause using indicator IC2. Calculation of percentage of patients who survived and were readmitted due to primary cause (indicators in parentheses): (IC3b – IC2) for ischaemic stroke. Calculation of percentage of patients who survived and were readmitted due to other cause: (IC3a – IC3b) for ischaemic stroke. Calculation of percentage of patients who survived not requiring admission: (100 – [(IC2) + (IC3b-IC2) + (IC3a-IC3b)]) for ischaemic stroke. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

39. For CHF patients (Figure 3.2), on average, 42% survived and did not return to acute care, while 35% survived but were readmitted (11% for CHF-related[8] and 24% for other causes) and 23% died in the following year. It is worth noting many patients who died were also readmitted to the hospital. For patients who suffered a CHF acute episode and were discharged, one-year all-cause mortality ranged from 8% in Japan to 33% in Slovenia. One-year CHF-related readmissions ranged from 1% in Italy to 17% in Israel. One-year readmissions for other reasons ranged from 0% in Costa Rica to 33% in Denmark. Patients who survived and were not readmitted range from 28% in Israel to 78% in Costa Rica.

[8] CHF-related admission: CHF admissions or admissions for CHF or late effects (sequelae) of CHF

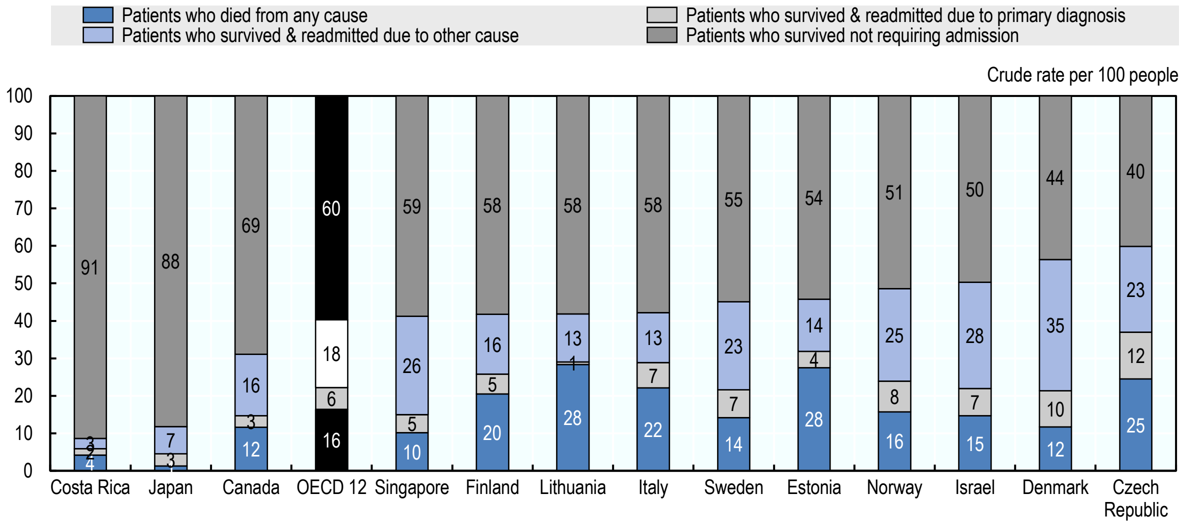
Figure 3.2. Patient outcome one year after discharge due to CHF, crude rates, 2018



Note: Data for UK (Northern Ireland) is missing. Data for Canada is sourced from 2017. Calculation of percentage of patients who died for any cause use indicator IC10. Calculation of percentage of patients who survived and were readmitted due to primary cause (indicators in parentheses): (IC11b – IC10) for CHF. Calculation of percentage of patients who survived and were readmitted due to other cause: (IC11a – IC11b) for CHF; Calculation of percentage of patients who survived not requiring admission: (100 – [(IC10) + (IC11b-IC10) + (IC11a-IC11b)]) for CHF. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

40. The analysis published in *Health at A Glance 2021* has been supplemented with further analysis of the outcomes for patients who suffered a haemorrhagic stroke (Figure 3.3). Similarly, there was wide variation between countries, albeit slightly worse outcomes compared to ischaemic stroke. For those discharged after an initial admission of haemorrhagic stroke, 60% survived and did not require an acute admission, 24% were readmitted in hospital and 16% died in the following year.

Figure 3.3. Patient outcomes one year after discharge due to haemorrhagic stroke, crude rates, 2018



Note: Data for UK (Northern Ireland) is missing. Data for Canada relates to 2017. Calculation of percentage of patients who died for any cause uses indicator IC6. Calculation of percentage of patients who survived and were readmitted due to primary cause (indicators in parentheses): (IC7b – IC6). Calculation of percentage of patients who survived and were readmitted due to other cause: (IC7a – IC7b). Calculation of percentage of patients who survived not requiring admission: (100 – [(IC6) + (IC7b-IC6) + (IC7a-IC7b)]). Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

41. These findings suggest there are variations across countries on the quality of integration between hospital and community care. However, caution is needed when interpreting data for outliers like Japan and Costa Rica. While most countries respected the guidelines that ensure methodologically robust indicator definitions and patient profiles, data for Japan is not nationally representative. Moreover, there are a number of potential factors partly explaining differences across countries (as discussed in Box 3.1) Interpretation of this data calls for a better understanding of the policies and features of the various health care systems as cross-country variations in outcomes can be partly explained by differences in the organisation of care delivery and access to care, as well as the contrasting quality of health data infrastructure. To inform policy action (Section 4), future work aims to perform policy analysis to better interpret the findings of this pilot. This will pertain data collection on the key features and policies affecting demand and supply of health care to answer questions such as:

- How are countries resolving poor care integration and reorganising care, specifically for patients undergoing care for stroke and CHF?
- How contrasting is the quality of health information systems and performance monitoring across countries that may affect the data collected with this pilot?
- Which provider payment incentives have been adopted to promote care integration?

Box 3.1. Some potential factors explaining variations on outcomes across countries

Data linkage practice in the UK (Northern Ireland)

- Most countries can link individual level data across multiple datasets with patient unique identifiers via computerised systems. However, in some countries such as in the UK (Northern Ireland), despite existing patient unique identifiers which allow data linkage across different datasets, linkage for this pilot was only possible manually. This time-consuming practice meant only some indicators were possible to be calculated given the current resources. This resulted in being unable to calculate the outcomes as shown in the figures above. The results from UK (Northern Ireland) suggested an increasing rate of all-cause and disease-specific readmission for ischaemic and haemorrhagic stroke.
- Existing resources also became an important limitation when data is linked from multiple sources for the first time. The use of ATC classifications for the prescribing indicators required clinical pharmacy support if these were not automatically available in the data.
- It is possible that this manual approach may result in low number of case identification with a consequent bias in the data. It is anticipated that planned changes to the governance structure will increase the ability to conduct these linkages in the future.

Recent changes in the ICD-10 coding of haemorrhagic stroke cases

- In the past, I62.9 was used to code for haemorrhagic stroke, more specifically “haemorrhagic stroke not otherwise specified”. As of 2015–2016, this condition has been coded as I61.9 “Intracerebral haemorrhage, unspecified”. Given these changes, several countries, including Canada, provided additional guidance to their coders (CIHI, 2021[68]), and I62 is used for the cases of intra- cerebral haemorrhage. However, countries may be experiencing some delays implementing the new guidelines, and still using I62.9 code as part of haemorrhagic stroke.

Differences in management of patients with CHF

- The proportion of CHF patients exclusively managed in primary care varies between OECD countries. A selection of CHF patients will be admitted to the hospital from primary care depending on different regulations across countries or regions. Therefore, the index populations that are admitted to hospital might be in different health states, varying from very severe cases to mild cases. Consequently, the risk on readmission or mortality might also vary across index populations. An additional indicator measuring the volume of the CHF patients managed in primary care and the percentage amongst them who are admitted to hospital could bring more insight towards understanding these cross-country variations.

Low rates for integrated care indicators recorded by Japan and Costa Rica

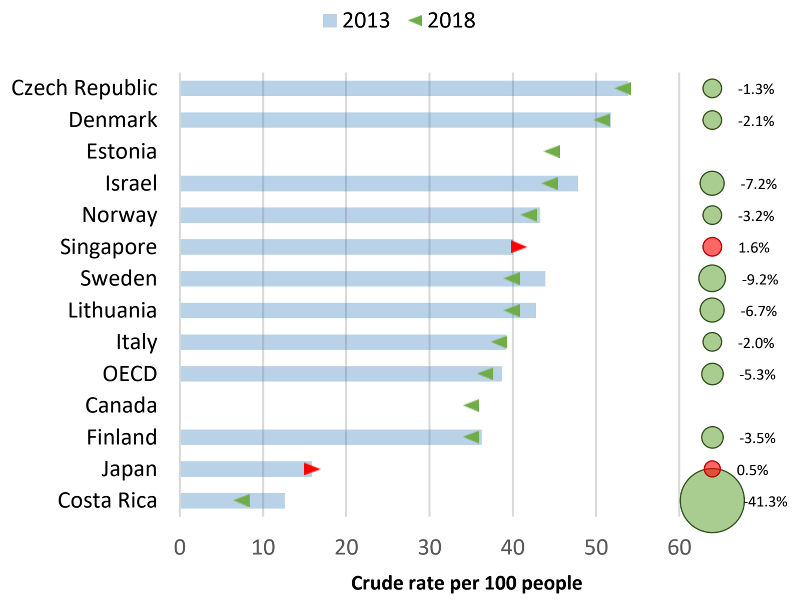
- Japan and Costa Rica showed the lowest rates for outcomes in the OECD Integrated Care Pilot Data Collection 2020-2021. This is consistent with indicators using mortality and hospital admission outcomes in other OECD health data collections. For instance, 30-day mortality after admission to hospital for ischaemic stroke and COPD hospital admission in adults, which were published in the HAG 2021 (OECD, 2021[7]). The results for Japan may be underestimated as these were not based on a nationally representative dataset accounting for only 30% of hospital activity in the country.

Source: Authors based on consultations with the members of the Expert Group for Integrated Care

Trend analysis within countries shows varying outcome improvements

42. As most countries reported data for the period 2013-2018, trend analyses were performed. This identifies changes over time, such as improvements in mortality and readmission rates. Crude rates and the relative percentage change between 2013-2018 for discharged stroke and CHF patients readmitted or dying in the year following discharge for any cause were published in *Health at A Glance 2021* (OECD, 2021, pp. 180-182[7]). These analyses have been supplemented with the inclusion of data for Denmark and Singapore. Most countries demonstrated small improvements on one-year readmissions due from any cause and mortality over a five-year period, with an average reductions of -5.3% following ischaemic stroke (Figure 3.4). Costa Rica and Sweden had large improvements for ischaemic stroke over five years (-41.3% and -9.2%, respectively). However, some countries reported worsening rates. That was the case of Singapore (1.6%) and Japan (0.5%) for ischaemic stroke.

Figure 3.4. Patients readmitted due from any cause or dying one year after discharge from ischaemic stroke, crude rates, 2013-2018

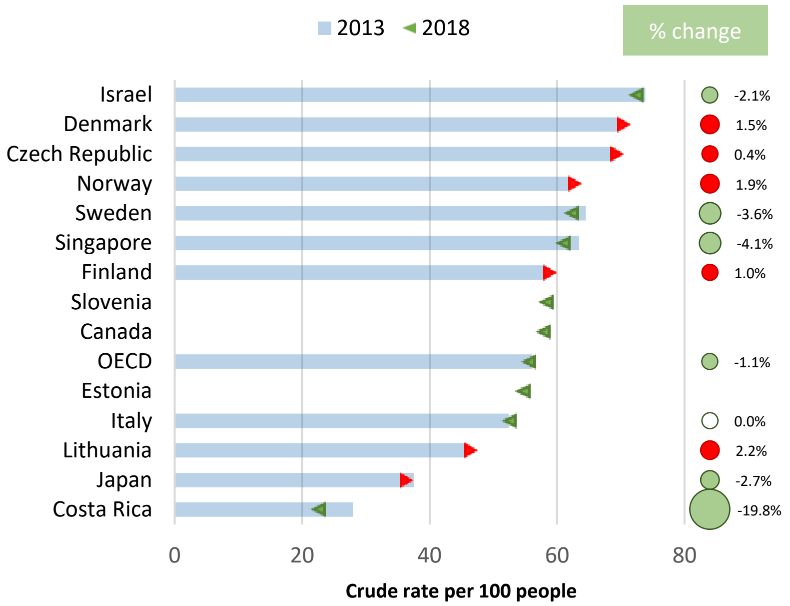


Note: Data labels report relative percentage change, 2013-2018. 2013 OECD average does not include Canada, Estonia and Singapore. The graph plots indicator IC3a, Ischaemic Stroke - Mortality or all-cause readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

43. With regard to CHF, the relative percentage change between 2013-2018 for one-year readmissions and mortality over a five-year period showed less dramatic changes (Figure 3.5). The average reduction was a reduction of -1.1%. Costa Rica, Singapore and Sweden had large improvements for CHF (-19.8%, -4.1% and -3.6%). However, various countries reported worsening rates. That was the case of Lithuania (2.2%), Norway (1.9%), Denmark (1.5%) and Finland (1%).

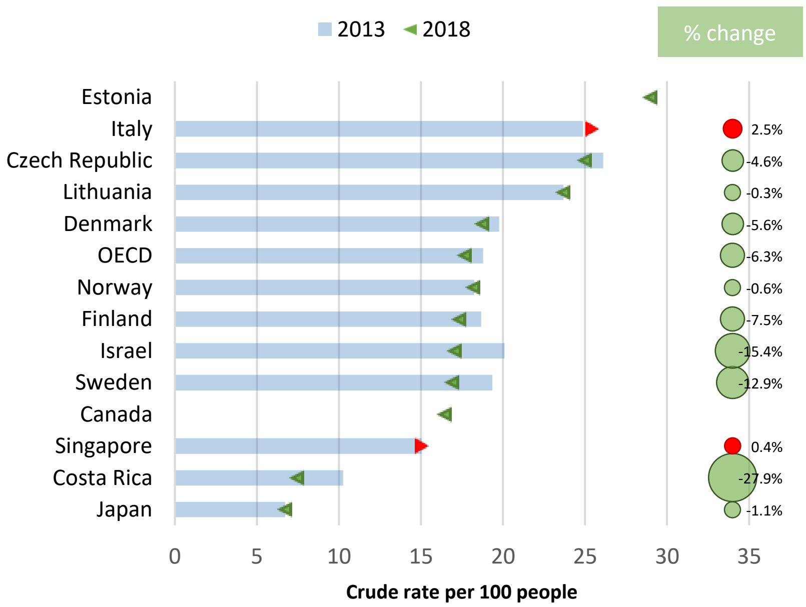
44. Moreover, some countries showed improvements for reducing one-year disease specific readmissions and mortality, namely Costa Rica (-27.9%) and Sweden (-12.9%) following an ischaemic stroke (Figure 3.6), and Costa Rica (-16.6%) and Finland (-3.4%) for CHF (Figure 3.7). However, other countries reported increased rates, namely Singapore (0.4%) and Italy (2.5%) for ischaemic stroke (Figure 3.6), and Israel (4.6%) and Italy (4.3%) for CHF (Figure 3.7).

Figure 3.5. Patients readmitted due from any cause or dying one year after discharge from CHF, crude rates, 2013-2018



Note: Data labels report relative percentage change, 2013-2018. 2013 OECD average does not include Canada, Estonia, Slovenia and Singapore. The graph plots indicator IC11a, CHF - Mortality or all-cause readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

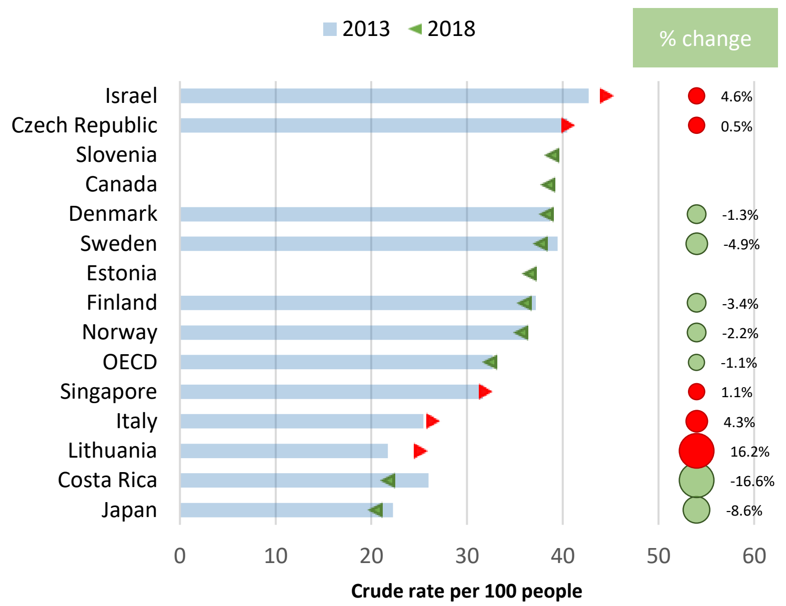
Figure 3.6. Patients readmitted due to the primary diagnosis or dying one year after discharge from ischaemic stroke, crude rates, 2013-2018



Note: Data labels report relative percentage change, 2013-18. OECD average does not include Canada, Estonia and Singapore. The graph plots indicator IC3b: Ischaemic Stroke - Mortality or disease-specific readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

45. Additional analysis for crude one-year mortality and readmission rates due to haemorrhagic stroke shows similar results with most but not all countries demonstrating decreases (Figure 3.8 and Figure 3.9). Moreover, additional statistical analysis on time trends using regression modelling supports these findings (see Supplementary Analysis for more detail).

Figure 3.7. Patients readmitted due to the primary diagnosis or dying one year after discharge from CHF, crude rates, 2013-2018



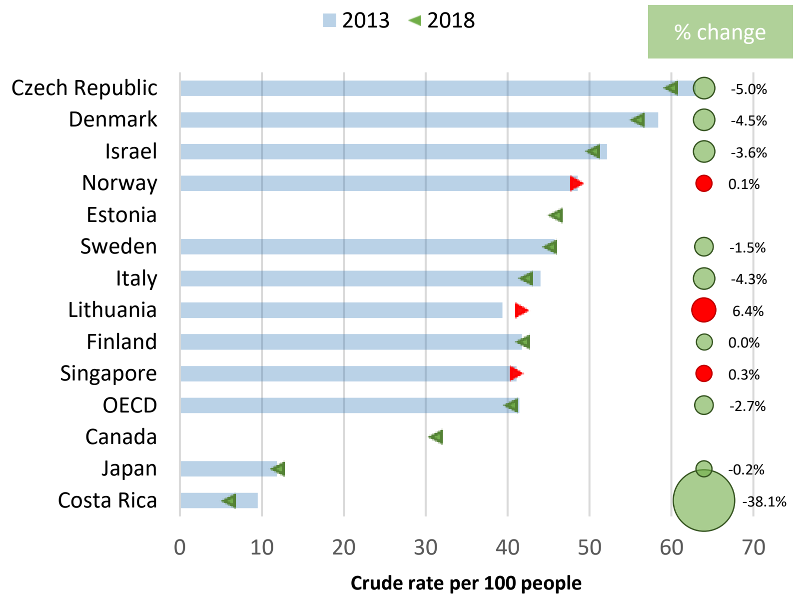
Note: Data labels report relative percentage change, 2013-2018. OECD average does not include Canada, Estonia, Slovenia and Singapore. The graph plots indicator IC11b: CHF - Mortality or disease-specific readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

46. The fact these findings are country-specific suggest variation in outcomes across countries can be (partly) explained by policy changes. For instance, some countries are reorganising service delivery by either devising innovative approaches to deliver care, forming care networks, or merging various independent providers into a single organisation. For example, in Finland, the new social and health care reform brings primary care, basic mental care, oral care, social care, outpatient rehabilitative care and some other specialist care services under the same management (Keskimäki et al., 2019[60]). Estonia is developing a new person-centred integrated care model between hospitals, outpatient, primary health care, and social services (Haigekassa, 2021[59]). Norway created intermediate care facilitates and Italy adopted "hospital at home" for patients to receive care in the community (OECD, 2014[69]). Sweden is adopting various reforms at national, regional and local levels for health and social care to operate in a integrated and person-centred care way (SOU, 2020[70]).

47. Also, various countries are revisiting how to incentivise providers to effectively work together – like using add-on payments and bundled payments (OECD, 2016[71]) – but evidence on improving outcomes is mixed (Barnett et al., 2019[72]; Joynt Maddox et al., 2018[73]) (Stokes et al., 2018[74]; Tsiachristas et al., 2013[75]). Add-on payments, including pay-for-performance (P4P), reward more co-ordinated, safer and effective care, and are widespread across OECD countries in primary care, specialists and acute hospitals. Bundled payments pool into a single payment all services delivered to a patient including prevention and treatment across hospitals, primary health and LTC or management for chronic conditions. For example, France uses bundled payments across in-patient and outpatient specialist care within 135 days after hip

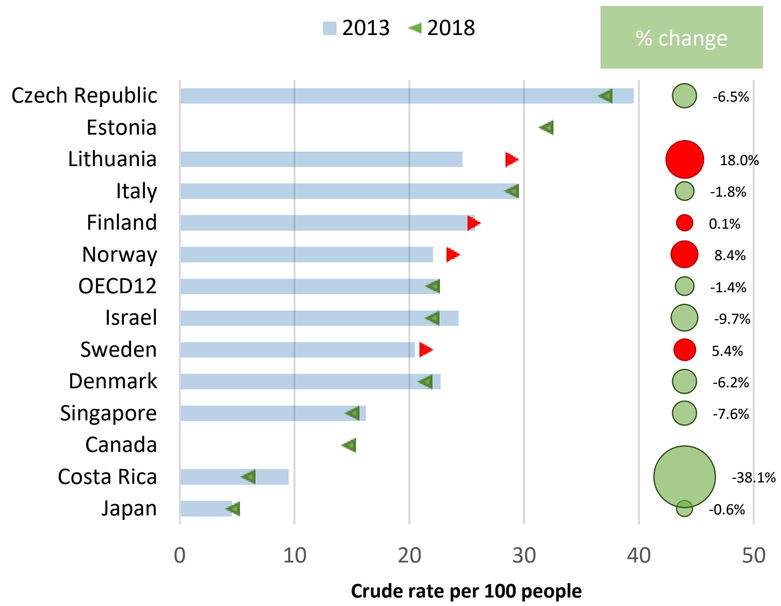
surgery (ATIH, 2020[76]), while some countries (Czech Republic, Denmark, Sweden, the UK) pay to reduce delayed hospital discharge (OECD, 2020[5]). Finland is developing needs-adjusted capitation fees across regional and local administrations to pay for health and social care (Keskimäki et al., 2019[60]). In order to use this data to inform policy action, more data are required on the key features and the various policies affecting payment mechanisms and reorganisation of care, as discussed in Section 4.

Figure 3.8. Patients readmitted due from any cause or dying one year after discharge from haemorrhagic stroke, crude rates, 2013-2018



Note: Data labels report relative percentage change, 2013-2018. The OECD average does not include Canada, Estonia and Singapore. The graph plots indicator C7a: Haemorrhagic stroke – Mortality or all cause readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.9. Patients readmitted due to the primary diagnosis or dying one year after discharge from haemorrhagic stroke, crude rates, 2013-2018



Note: Data labels report relative percentage change, 2013-2018. The OECD average does not include Canada, Estonia and Singapore. The graph plots indicator IC7b, Haemorrhagic stroke – Mortality or disease-specific readmission within 365 days after discharge. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Multiple outcome indicators are required to measure integrated care

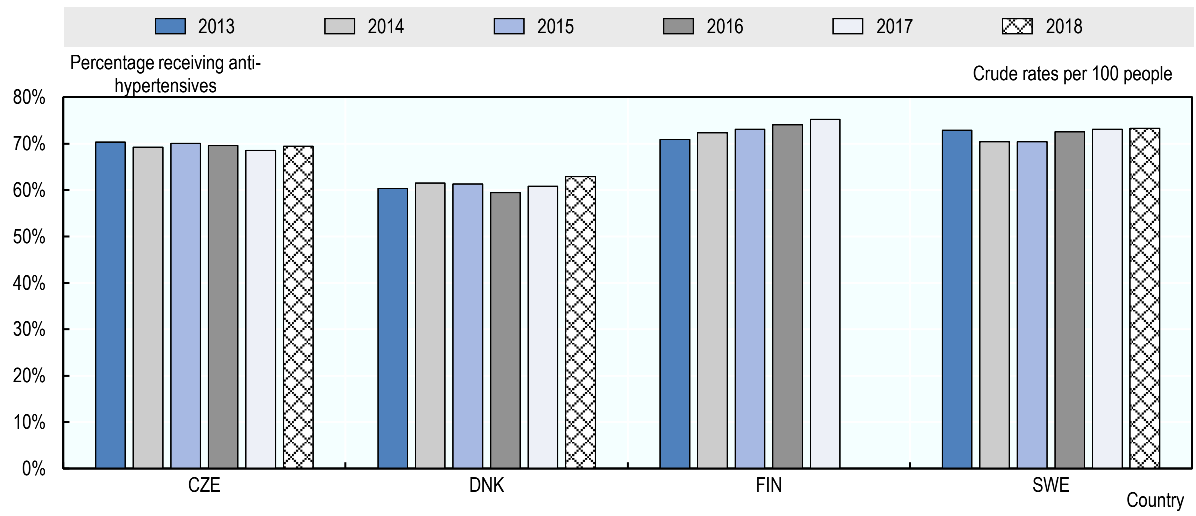
48. Multiple outcome indicators are required to measure integrated care. For example, outpatient medicine prescribing data after hospital discharge can provide insights about the variation in the quality of integration between hospital and community care. The OECD pilot collected data on prescription rates of appropriate medications for secondary prevention 12 to 18 months after hospital discharge for stroke and CHF. However, only four countries (Czech Republic, Denmark, Finland and Sweden) provided such data (Table 3.1). This pilot demonstrated data collection was feasible, but linkage remains a challenge between hospital data to pharmaceutical prescribing data. This finding reinforces the need for countries to harness data linkage in order to follow patients through the health care system and measure integrated care (see recommendations for future work in Section 4).

49. Analysis of the prescribing data for anti-hypertensive use after haemorrhagic stroke shows little variation over time for aggregate rates but some differences between countries, namely Denmark showed a slightly lower prescribing rate of anti-hypertensives than the three other countries (Czech Republic, Finland and Sweden) (Figure 3.10). Differences across countries are suggested to be driven by prescribing rates for those over the age of 65, when comparing data for prescribing rates in Denmark and in the three other countries (Figure 3.11). On average, differences of prescribing rates of anti-hypertensives between ischaemic and haemorrhagic stroke show a lower rate of prescribing in haemorrhagic stroke (average rate of 70%) than ischaemic stroke (78%). Otherwise the results were consistent (see Supplementary Analysis for more detail).

50. Moreover, Figure 3.12 shows the association between medicine prescribing and mortality for ischaemic stroke over time and across Czech Republic, Denmark, Finland and Sweden. Prescribing rates were negatively associated with all-cause mortality (-0.76) as well as stroke-related readmissions (-0.93),

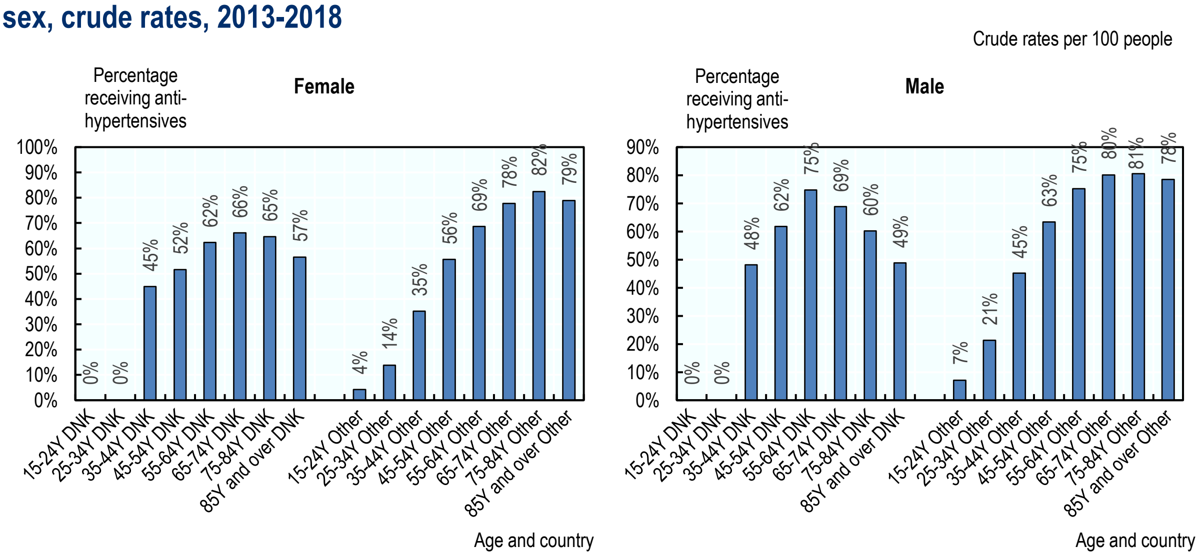
suggesting that antihypertensive medicines are associated with decreased readmissions. The results are qualitatively similar when restricting analysis to older patients (i.e., 45+, 65+) or to more severe cases (i.e., ICD-10 I60-61 or ICD-10 I63-I64). See Supplementary Analysis for more detail on these results.

Figure 3.10. Haemorrhagic stroke, relative proportions of prescribed anti-hypertensive by year, crude rates, 2013-2018



Note: Prescribing indicators (IC8) were supplied by four countries, CZE, DNK, FIN and SWE. No 2018 data were available for FIN. The graph plots indicator IC8, Haemorrhagic stroke – Prescribed antihypertensive medicines between 12 and 18 months after haemorrhagic stroke. Further details in Table 2.4. The data presented are crude rates without standardisation.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.11. Haemorrhagic stroke, relative proportions of prescribed anti-hypertensive by age and sex, crude rates, 2013-2018

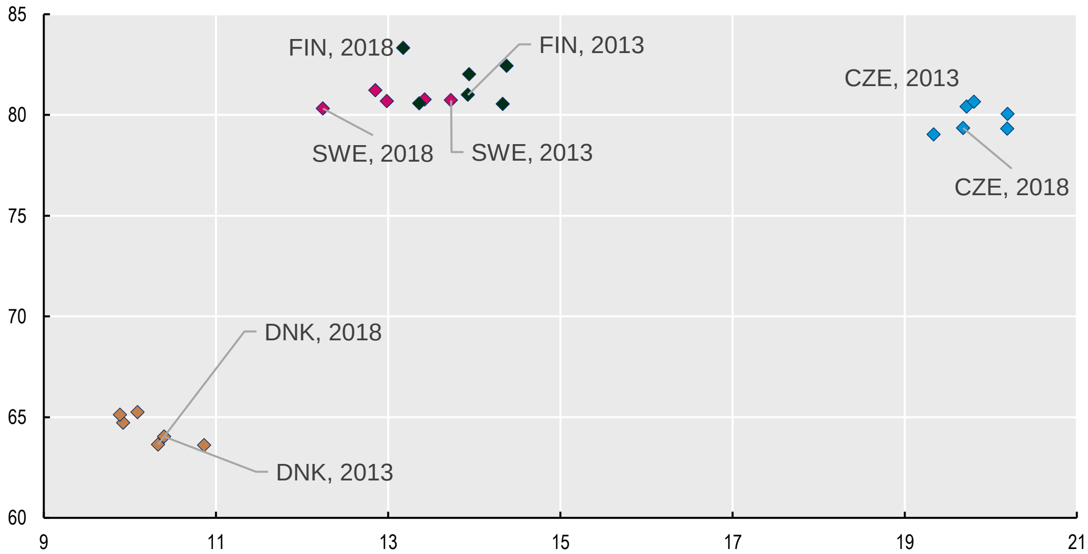


Note: Data were supplied by four countries, CZE, DNK, FIN and SWE. "Other" category combines data for CZE, FIN and SWE. The graph plots indicators IC8, Haemorrhagic stroke – Prescribed antihypertensive medicines between 12 and 18 months after haemorrhagic stroke. Further details in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

51. Results of correlation analysis show inconsistent associations between mortality and hospital readmissions across countries and over time between the different disease indicators. For example, Figure 3.13 shows the association between all-cause mortality and stroke-related readmissions for ischaemic stroke patients across countries and over time. On average, ischaemic stroke-related readmissions are suggested to be associated with lower mortality. However, for both haemorrhagic stroke and CHF patients, on average, readmissions caused by the primary diagnosis are associated with higher mortality. Details for the correlation analysis performed can be found in the Supplementary Analysis.

52. Clarifying these inconsistent results between diseases to allow interpretable international comparisons of integrated care delivery requires further policy analysis and more data for various dimensions of health systems performance. These dimensions include efficiency and access to health care. The indicators are proxies for quality of integrated care and improvements in integrated care delivery could be expected to affect outcomes in the same direction. For example, it could be expected that improved integrated care delivery may result in reductions in both mortality and urgent care (readmissions).

Figure 3.12. Association between medicine prescribing and mortality for ischaemic stroke, crude rates, 2013-2018

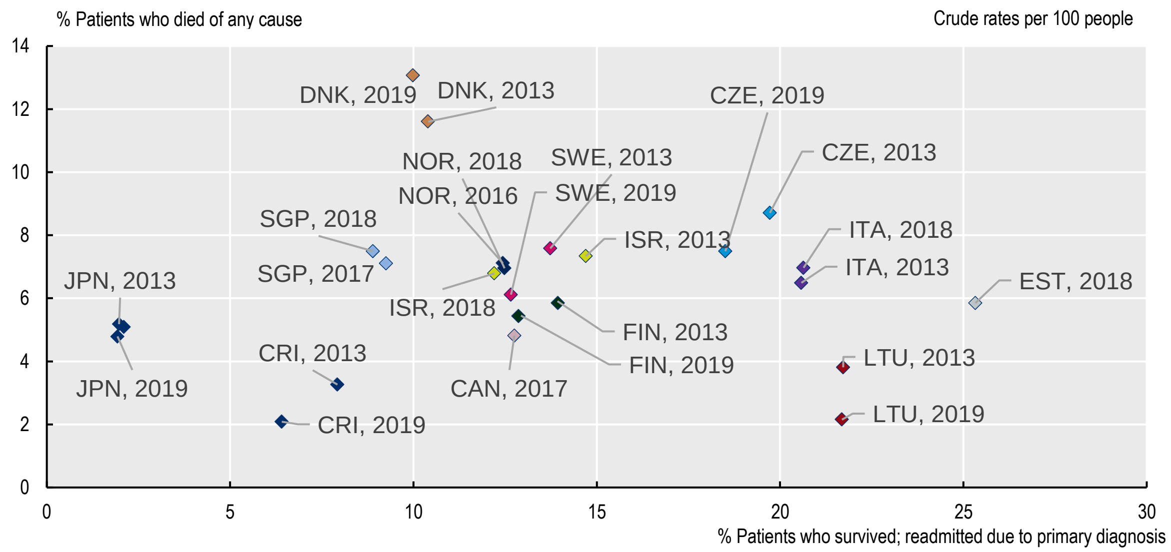


Note: The graph plots the following indicators: IC2: Ischaemic Stroke - All-cause mortality within 365 days after discharge; and IC4: Ischaemic Stroke - Prescribed antihypertensive medicines between 12 and 18 months after ischaemic stroke. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

53. However, there may be some concern that care reduction (including readmissions) rather than integration may result in increasing mortality. This concern may also occur with prioritising care for a specific disease, for example stroke, in a multi-morbid population, which may result in increased admissions due to the sequelae of treatment, such as falls with aggressive hypertensive therapy, or deterioration of general health. The strong positive correlation between all-cause and disease-specific readmissions across all diseases supports this claim (see the Supplementary Analysis for more detail). A number of complex mechanisms at play confound interpretation of these data. For example, higher readmission rates may reflect better access to appropriate care that is not available in the community but delivered at the hospital. Better access to hospital care may prevent mortality and may increase the number of readmissions. Conversely, a negative association between readmissions and mortality may reflect the fact that higher mortality in the community may lead to lower probability of a readmission when estimated over a year. Moreover, differences in readmission rates may be due to differences in patient survival rates

with countries showing low mortality likely to have a larger share of sicker patients at risk of a readmission (Laudicella, Li Donni and Smith, 2013[77]).

Figure 3.13. Association between mortality and stroke-related readmissions for ischaemic stroke patients, crude rates, 2013-2018



Note: The graph plots the following indicators: IC2, Ischaemic Stroke - All-cause mortality within 365 days after discharge; and IC1b, Ischaemic Stroke - Disease-specific hospital readmissions within 365 days after discharge. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

3.3. Methodological reflections to improve international comparability for the next OECD data collection on Integrated Care

54. The validity of comparisons between countries is aided by reducing sources of unwanted variation. The identification of cases of stroke and CHF was designed to maximise the homogeneity of the patient cohort and allow comparison between countries. It involved case identification using an urgent (non-elective) admission of greater than one day and a washout period of five years. The identification of outcomes also used the definition of acute care for readmissions, either related to a primary diagnosis of stroke or the sequelae of stroke, or heart failure, defined using the ICD criteria.

55. This section discusses some methodological reflections and actions taken by the Expert Group to improve the international comparability for future data collections. These included considerations related to coding practices and use of granular data at the ICD level, standardisation methods and reference populations to adjust crude data on readmissions, mortality and prescribing rates.

Differences in coding practices hamper the use of granular ICD level data

56. All countries except Canada and Slovenia were able to submit data on the distributions of the ICD codes across subtypes of ischaemic stroke (ICD-10 I63-I64) and haemorrhagic stroke (ICD-10: I60-I62), as shown in Table 3.1. Israel used ICD-9 codes which have been mapped to ICD-10 codes for comparability. Results from the pilot show substantial differences in the relative proportions of different stroke subtypes between countries. Figure 3.14 demonstrates the relative proportions of different ICD codes for haemorrhagic stroke using data in 2018. While there is some consistency in the proportion of

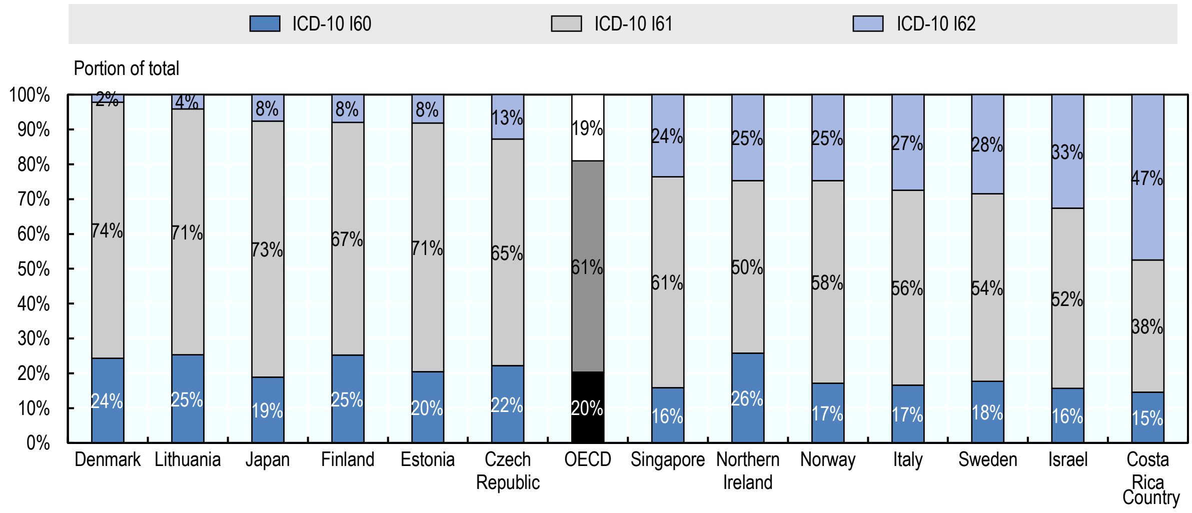
subarachnoid haemorrhagic strokes (ICD-10 I60), there is variation in the relative proportions of intracerebral (ICD-10 I61) and other intracranial (ICD-10 I62) haemorrhagic strokes. Denmark, Japan and Lithuania had relatively lower rates of coding for other intracranial haemorrhagic strokes (ICD-10 I62) while Costa Rica had a relatively higher rate. Coding differences across countries following recent changes on the classification of ICD-10 I62 (intra-cranial haemorrhage) from haemorrhagic stroke to “not a stroke” might cause this variation (Box 3.1). For ischaemic stroke, there were differences across countries between the relative proportions of the codes for the subtypes of ischaemic stroke (ICD-10: I63-I64) (see Supplementary Analysis for more detail). Most countries had a similar proportion over time; one exception was the United Kingdom (Northern Ireland), which had a decreasing proportion of other intracranial (ICD-10 I62) haemorrhagic strokes over time.

57. Moreover, there are some consistent differences in readmission and mortality rates between the various ICD codes across countries. For example, in the case of haemorrhagic strokes, subarachnoid haemorrhagic (ICD-10 I60) strokes are associated with a lower combined rate of readmission and mortality than other haemorrhagic strokes. Also, all-cause readmissions for other intracranial strokes (ICD-10 I62) showed relatively higher rates than other forms of haemorrhagic stroke. For the case of ischaemic strokes, stroke not specified (ICD-10 I64) showed relatively higher rates of all-cause readmission than the other type of ischaemic stroke (see Supplementary Analysis for more detail).

58. The source of the variation is not known but could include differences in epidemiology as well as differences in ICD coding practices (Hall et al., 2016[78]). In clinical terms, haemorrhagic and ischaemic strokes are clusters of different injuries to the brain allocated to different ICD-10 codes and can require distinct medical intervention strategies, for example thrombolysis for ischaemic stroke and operative intervention for sub-arachnoid haemorrhage. The epidemiology and prognosis of these may differ, for example subarachnoid haemorrhage (ICD-10 I60) has a lower average age of first incidence than intracerebral haemorrhage (ICD-10 I61) (Johansen et al., 2006[79]). Different proportions of patients among the types of strokes may result in different average outcomes, despite the outcomes for each group being the same. Additionally, differences in ICD coding between countries and over time may confound the analysis. More accurate diagnosis, for instance, due to greater use of sophisticated imaging, may be associated with better identification of the type of strokes resulting in a lower risk of misclassification bias and different distribution of patients across subtypes of strokes (Ryan et al., 2021[80]).

59. Given these differences in coding practices across countries and the potential for misclassification bias, the use of disaggregated ICD code data may not be useful and international comparisons should instead rely on data for the two types of stroke at aggregated level i.e., for haemorrhagic stroke in total (i.e. the aggregate if ICD-10 I60-I62) and ischaemic stroke in total (i.e. the aggregate of ICD-10 I63-I64).

Figure 3.14. Haemorrhagic stroke, relative proportions of different ICD codes, 2018



Note: ICD-10 I60 is subarachnoid haemorrhage; ICD-10 I61 is intracerebral haemorrhage and ICD-10 I62 is other non-traumatic intracranial haemorrhage. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Age and sex variation across countries requires standardisation for international comparisons

60. Standardisation is required because variation across countries on age-sex structure translates into differences in outcomes. All countries were able to submit data for age and sex breakdown to the OECD Pilot Data Collection on Integrated Care. Results show large differences between the conditions in the age and sex distribution as shown in Table 3.2. The small sample size in some countries, combined with disaggregated data leading to very small numbers (less than 5), produced some minor inconsistencies between the totals and the individual age sex categories (see Table 3.2). Patients suffering an acute episode due to CHF were older, while patients suffering a haemorrhagic stroke were younger. Moreover, male patients tended to be more common than women in ages between 35 and 74, whereas women were more common in older age cohorts. With regard to total population size, haemorrhagic stroke is the less common than ischaemic stroke, making around a quarter of stroke cases.

Table 3.2. Differences between diseases in age and sex categorisation

Age categories	Ischaemic Stroke		Haemorrhagic Stroke		Congestive Heart Failure	
	Male	Female	Male	Female	Male	Female
15 to 24 years	0.0%	0.0%	0.4%	0.2%	0.0%	0.0%
25 to 34 years	0.3%	0.2%	0.8%	0.6%	0.2%	0.1%
35 to 44 years	1.1%	0.7%	2.5%	1.7%	0.8%	0.3%
45 to 54 years	3.9%	1.9%	5.9%	4.2%	2.3%	0.8%
55 to 64 years	8.9%	3.8%	9.2%	6.0%	5.3%	2.3%
65 to 74 years	15.6%	9.4%	13.5%	9.6%	11.2%	7.1%
75 to 84 years	16.1%	16.3%	14.4%	14.2%	17.3%	17.9%
85 and years and over	7.1%	14.5%	6.6%	10.1%	12.3%	22.1%
Total number	**1,050,133**		**305,171**		**1,207,264**	

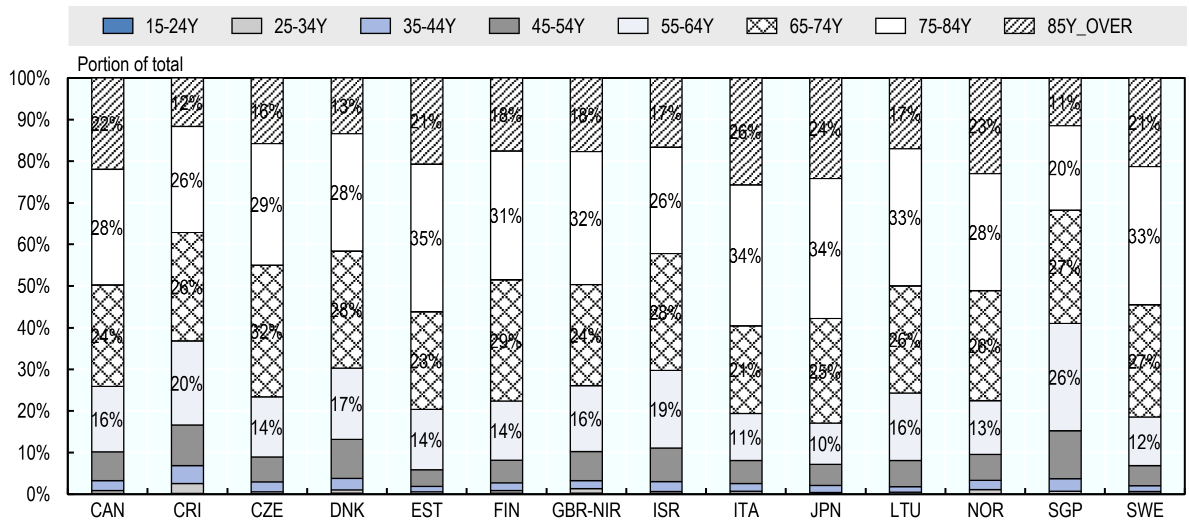
Note: Results are for the entire data collection, i.e. all years and all countries. Some countries provided information for some but not all indicators, therefore, the populations are calculated using indicators IC2, IC6 and IC10. See indicator definitions in Table 2.4.

Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

61. Results from the pilot also show some differences across countries in patient age-sex distribution as per Figure 3.15. For example, when looking at the age structure of patients suffering from ischaemic stroke, Japan and Italy have a relatively greater proportion of patients aged over 85. Moreover, for most countries the differences over time were minimal. However, there were exceptions to this, for example, Japan showed an increase in the proportions of those aged over 85 between 2013 (20%) and 2019 (25%) for ischaemic stroke. There were also one-off changes in the composition for a single year within a country, often in countries with a smaller cohort. For example, the proportion of men aged over 85 in Costa Rica with haemorrhagic stroke was consistently between 6% and 8% per cent, with an increase to 12%in 2017.

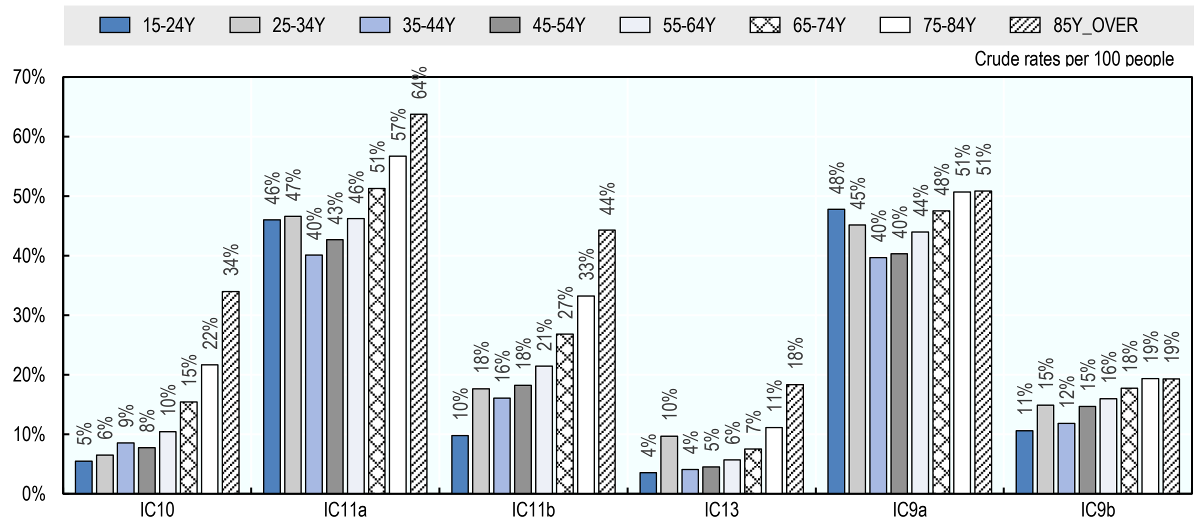
62. Disease incidence of stroke and CHF are associated with aging. Age has been demonstrated to be an independent prognostic indicator for mortality after a stroke (Takashima et al., 2020[81]). It has also been demonstrated to be associated with increased admissions for all causes, but less so for disease specific admissions (Johansen et al., 2006[79]). These broad trends, consistent with the literature, are seen in the data from the pilot study. There is a large increase in one-year mortality associated with age; this increase is larger than the changes in 30-day mortality after admission. Outcomes related to CHF demonstrated a "J" shaped association with age for all-cause readmissions (see Figure 3.16). There were differences between the sexes, for example with men having a higher rate of mortality over the age of 75 after an admission with CHF (See in more detail the Supplementary Analysis).

Figure 3.15. Age structure of patients suffering from ischaemic stroke, 2018



Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.16. Mortality, all-cause readmissions and disease-specific readmissions one year after discharge from CHF, crude rates, 2018

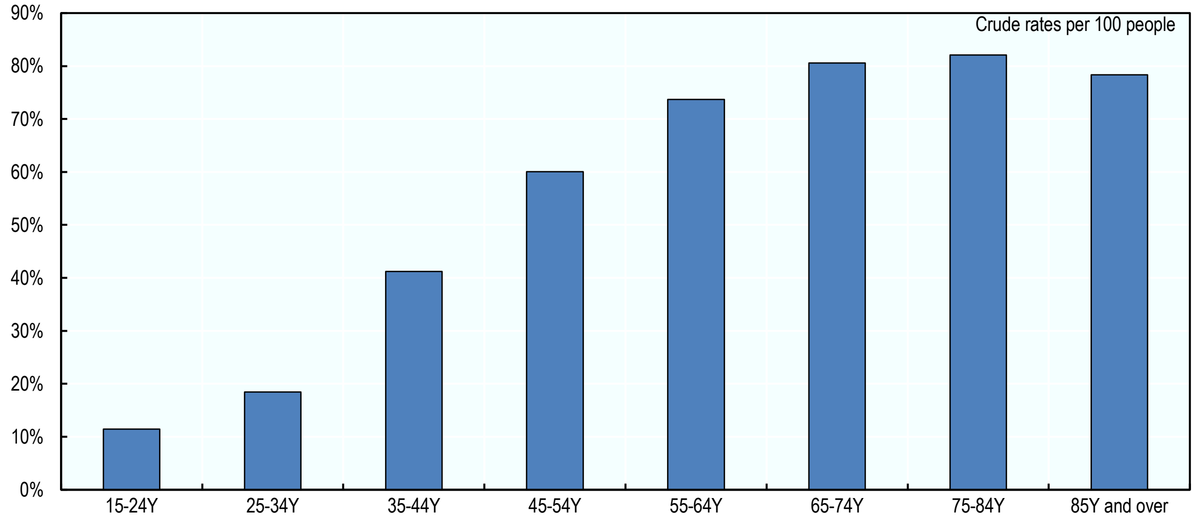


Note: The graph plots the following indicators: IC10, CHF - All-cause mortality within 365 days after discharge; IC11a, CHF - Mortality or all-cause readmission within 365 days after discharge; IC11b, CHF - Mortality or disease-specific readmission within 365 days after discharge; IC13, CHF - Case fatality within 30 days of the admission date; IC9a, CHF - All-cause hospital readmissions within 365 days after discharge; IC9b, CHF - Disease-specific hospital readmissions within 365 days after discharge. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

63. However, some countries demonstrated variation around these broad trends. For example, the Czech Republic did not show an increase with age in all-cause readmission rates for ischaemic stroke as most countries did. Moreover, there may be an issue related to small numbers captured in younger age cohorts which may result in wide variation in the outcomes of the indicators. For example, the high rate of readmission for the 15- to 24-year-old cohort in Lithuania and the UK (Northern Ireland) is on the basis of less than ten individuals. Excluding this cohort results in Lithuania having an age profile similar to most other countries. There is variation in the indicators between countries when considering the age cohorts, for example, the rate is lower for all ages in Italy and Japan compared to Norway.

64. Data on prescribing rates demonstrated a different relationship with age. The prescribing rates increased with age, then appeared to flatten at the older age cohorts. There were much lower rates of prescribing anti-hypertensives for the below 45 age group for ischaemic and haemorrhagic stroke. This may represent appropriate treatment of a different aetiology. It may be appropriate to consider only those over 45 for comparability. There was consistency of prescribing across age groups in the CHF population.

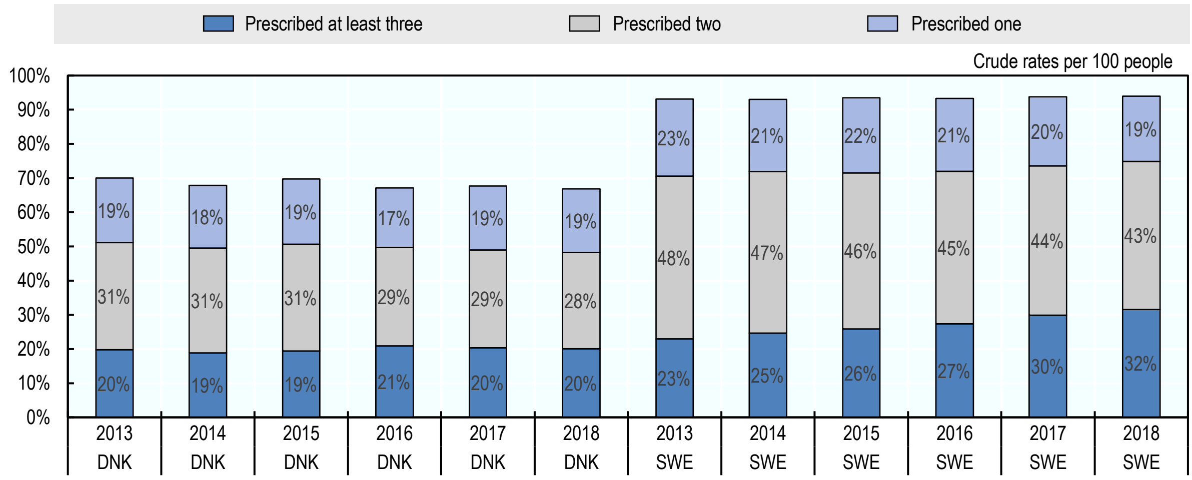
Figure 3.17. Prescribing rate of anti-hypertensives 12-18 months after ischaemic stroke, crude rates, 2018



Note: Prescribing indicators (IC4) were supplied by four countries, CZE, DNK, FIN and SWE. The graph plots indicator IC4, Ischaemic Stroke - Prescribed antihypertensive medicines between 12 and 18 months after ischaemic stroke. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

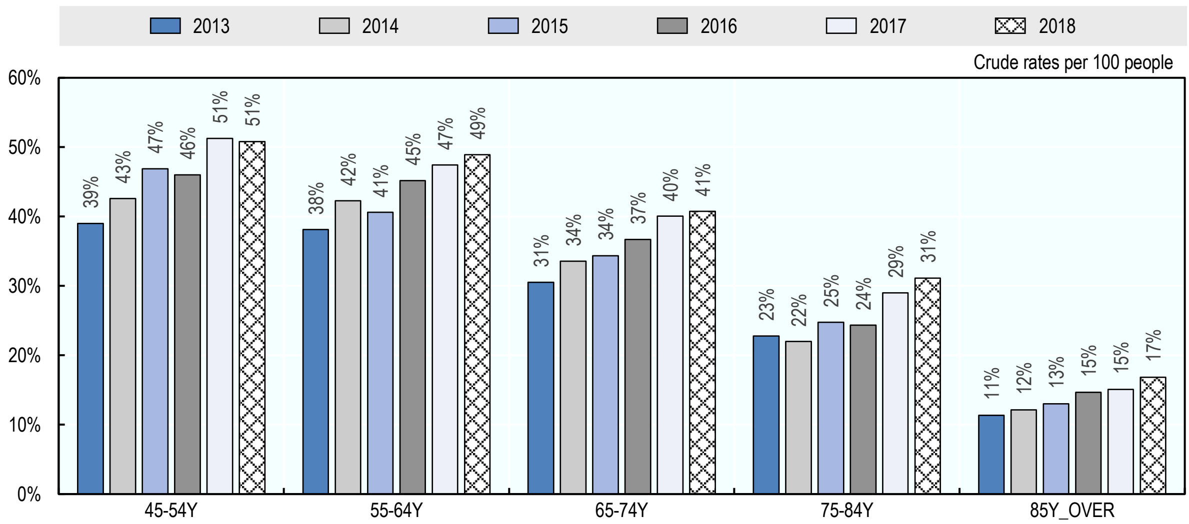
65. The data collection of the prescribing indicator for CHF was stratified by the number of pharmaceutical classes prescribed between 12 and 18 months after discharge. The categories were one, two and three or more classes of anti-hypertensives prescribed. Only two countries (Sweden and Denmark) were able to provide this information (Figure 3.18). Although the total rate of prescribing anti-hypertensives is not changing over time, there has been an increase in intensity of treatment in Sweden over time, with a greater proportion of the cohort receiving three or more classes of anti-hypertensives. The increase in the prescribing triple therapy over time occurred consistently over most age cohorts (Figure 3.19). Although the absolute change in the over 85 age group was the least, relatively it was an increase of almost 50 per cent.

Figure 3.18. Prescribing rate of anti-hypertensives 12-18 months after CHF admission, crude rates, 2013-2018



Note: Prescribing indicators (IC12) for CHF were supplied by two countries, Denmark (DNK) and Sweden (SWE). IC12: CHF - Prescribed medicines between 12 and 18 months after heart failure under Triple Therapy, Double Therapy or Monotherapy. Incremental rate of prescribing of one or two classes was calculated by subtracting the number with at least three classes prescribed from those with at least two classes prescribed; and then subtracting from the number with at least two classes prescribed those with one or more classes prescribed. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.19. Prescribing rate of three or more anti-hypertensives for CHF 12 to 18 months in Sweden, crude rates, 2013-2018



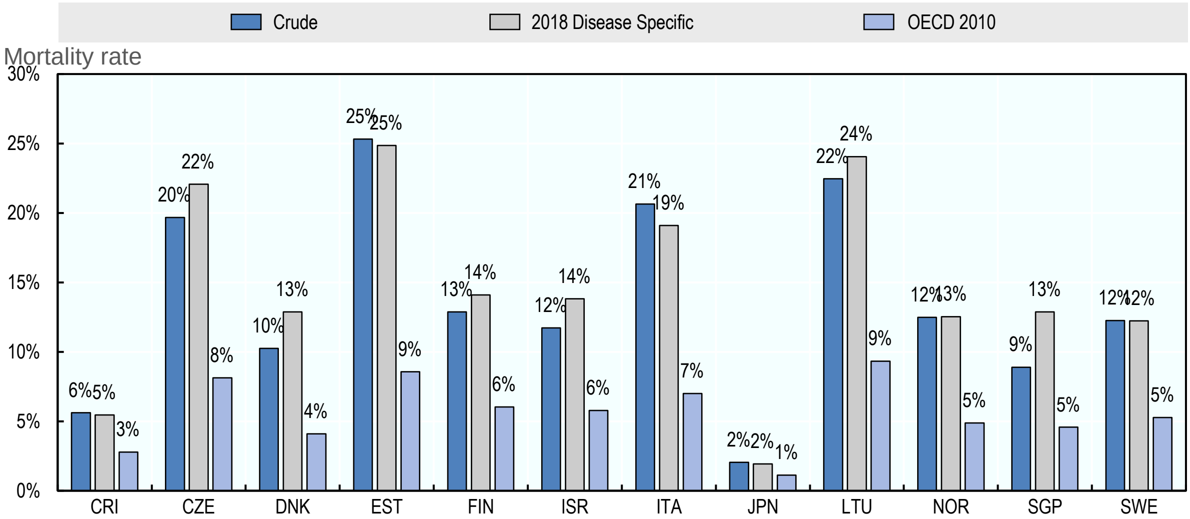
Note: The prescribing indicator for CHF is IC12. IC12: CHF - Prescribed medicines between 12 and 18 months after heart failure under Triple Therapy, Double Therapy or Monotherapy. Incremental rate of prescribing of one or two classes was calculated by subtracting the number with at least three classes prescribed from those with at least two classes prescribed. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Caution is needed when selecting a reference population for standardisation

66. There is increased uncertainty when comparing crude rates because of the differences of the population age and sex structure across countries. Moreover, some countries artificially changed age-sex distribution because some age-sex cohorts sum up very small sample sizes and raise data privacy issues. Given these differences, standardisation on both age and sex was conducted. It is important, however, to decide on a reference population to perform such standardisation; this is a pragmatic choice that should aid the comparisons that could be made. Ideally, the population should reflect an age distribution not greatly different from the study populations however, the choice of population can alter the results. For example, choosing a standard population with a greater number of older people will weigh the changes occurring in older people to a greater extent. There are two types of reference populations - internal and external - internal populations are derived from the total of the study groups and external populations are drawn from outside of the analyses (Tripepi et al., 2010[82]).

67. To standardise data resulting from this OECD pilot, two suggested reference populations were used: (1) the total 2010 OECD population, and (2) the 2018 disease specific population. The total 2010 OECD population is an external population used for most OECD analytical work. An advantage is that comparisons between different countries can be aided by comparing other OECD indicators that may be relevant. It also allows comparison across diseases by using the same reference population, and for the case of this analysis, between the CHF, haemorrhagic and ischaemic stroke populations. However, it also has disadvantages, as the proportion of younger age groups is greater in this population than the alternative populations, which may potentially affect the analysis. For example, results from the pilot when standardising using the OECD 2010 standard population show changes in the relative ordering of some countries compared to the crude rates, particularly for those countries with small number of individuals aged below 45 (see Figure 3.20). When using the total 2018 ischaemic stroke population, for example, Italy with a larger proportion of people aged above 85 showed a relatively better disease-specific mortality rate. Conversely, Singapore with a relatively younger age profile had a slightly worse disease specific rate for mortality in ischaemic stroke. This means that if the 2010 OECD population were to be used, it should be combined with an age cut-off restricted to older population e.g. 45 years old. Otherwise, the problem of small cells with a large effect on the indicator outcome persists. This is solved by taking the 2018 disease population to be used for standardisation, which is the recommendation that follows from this analysis.

Figure 3.20. Comparison of mortality rates due to ischaemic stroke between different standardisation populations, 2018

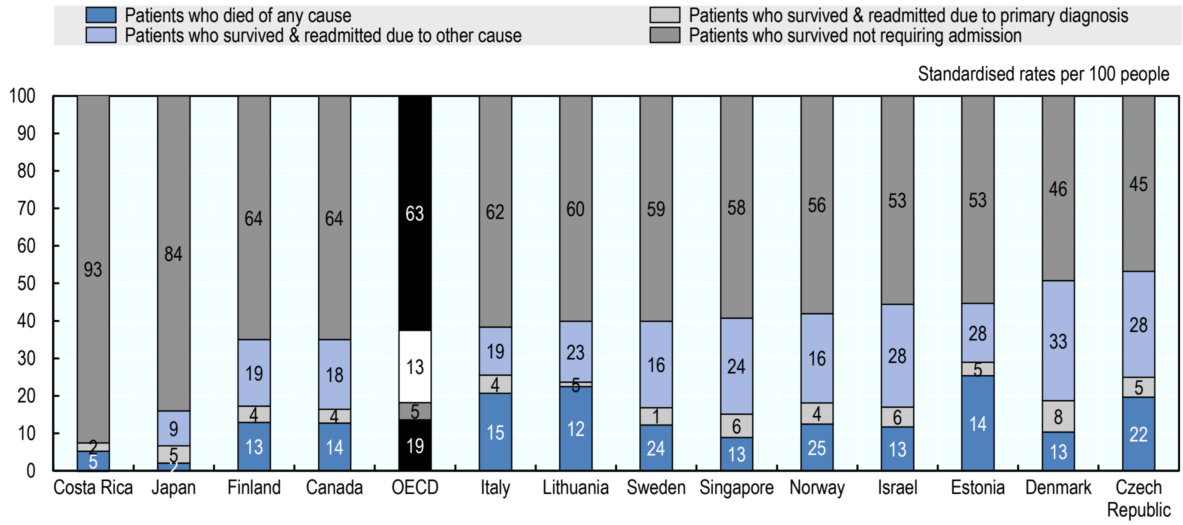


Note: The graph plots indicator IC2, Ischaemic Stroke - All-cause mortality within 365 days after discharge. See indicator definitions in Table 2.4. Canada is not included in the standard population.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

68. Comparison between crude and standardised rates showed some differences when analysing comparisons across countries and time trends for one-year mortality and readmission rates. For example, standardised rates suggest that relative performance of Singapore and Norway are reversed with regard to mortality in ischaemic stroke (Figure 3.21). This is consistent with the relatively younger population in the Singapore cohort. There are also some changes in the relative performance over years, with Japan moving from a small worsening in the crude rates to a small improvement in the standardised rates (Figure 3.22). These results are similar to differences found between crude and standardised rates for haemorrhagic stroke (Figure 3.24) and CHF (Figure 3.23).

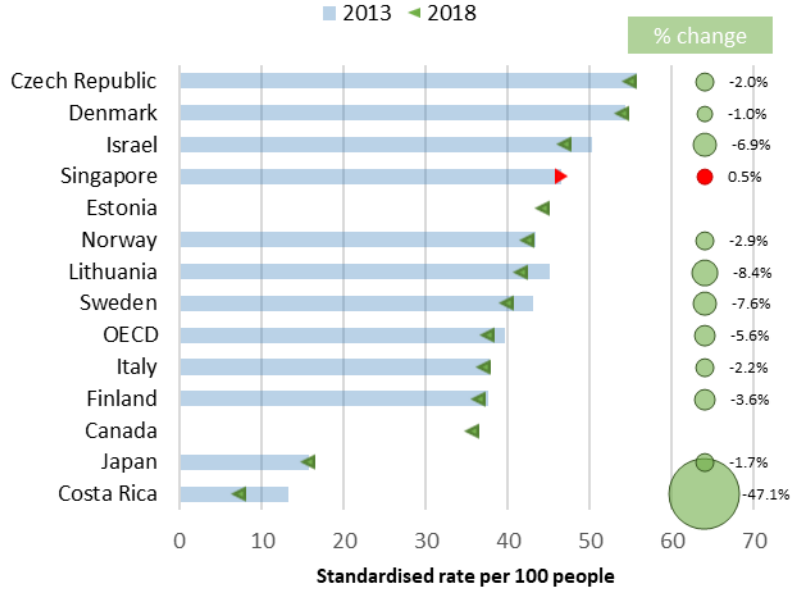
69. Finally, findings from correlation analysis are similar when considering both crude and standardised rates. In general, the results are qualitatively similar when comparing crude and standardised rates for ischaemic stroke, haemorrhagic stroke and CHF as well as when restricting the analyses to older patients (i.e., 45+, 65+). Details for this analysis can be found in the Supplementary Analysis.

Figure 3.21. Patient outcomes one year after discharge due to ischaemic stroke, standardised rates, 2018



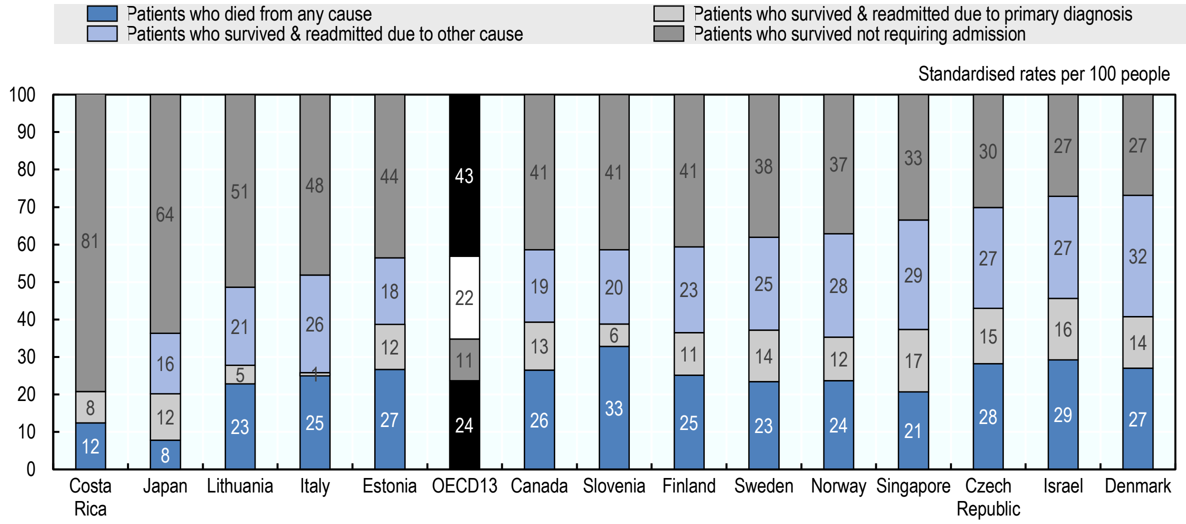
Note: Data for UK (Northern Ireland) was not included because of incomplete indicators. Data for Canada are sourced from 2017. Calculation was conducted after standardisation. Calculation of percentage of patients who died for any cause using the following indicators: IC2. Calculation of percentage of patients who survived and were readmitted due to primary cause: (IC3b – IC2). Calculation of percentage of patients who survived and were readmitted due to other cause: (IC3a – IC3b). Calculation of percentage of patients who survived not requiring admission: (100 – [(IC2) + (IC3b-IC2) + (IC3a-IC3b)]). See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.22. Patients readmitted due from any cause or dying one year after discharge from ischaemic stroke, standardised rates, 2013-2018



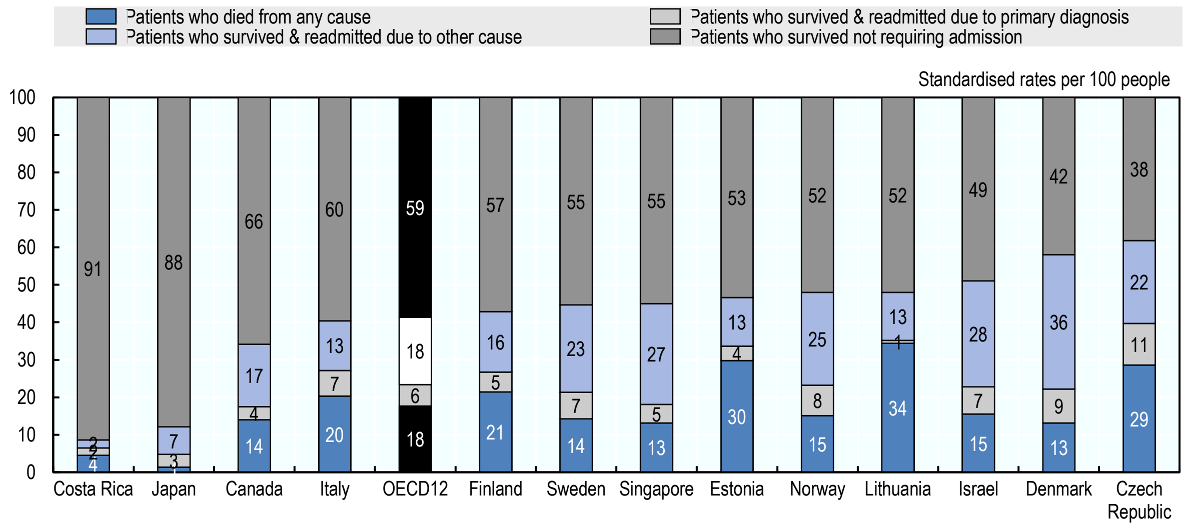
Note: Data labels report relative percentage change, 2013-2018. 2013 OECD average does not include Canada, Estonia and Singapore. The graph plots indicator IC3a, Ischaemic Stroke - Mortality or all-cause readmission within 365 days after discharge. See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.23. Patient outcomes one year after discharge due to CHF, standardised rates, 2018



Note: Data for UK (Northern Ireland) is missing. Data for Canada is sourced from 2017. Calculation was conducted after standardisation. Calculation of percentage of patients who died for any cause using the following indicators: IC10. Calculation of percentage of patients who survived and were readmitted due to primary cause: (IC11b – IC10). Calculation of percentage of patients who survived and were readmitted due to other cause: (IC11a – IC11b); Calculation of percentage of patients who survived not requiring admission: (100 – [(IC10) + (IC11b-IC10) + (IC11a-IC11b)]). See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

Figure 3.24. Patient outcomes one year after discharge due to haemorrhagic stroke, standardised rates, 2018



Note: Data for UK (Northern Ireland) is missing. Data for Canada relates to 2017. Calculation of percentage of patients who died for any cause using the following indicators: IC6. Calculation of percentage of patients who survived and were readmitted due to primary cause: (IC7b – IC6). Calculation of percentage of patients who survived and were readmitted due to other cause: (IC7a – IC7b). Calculation of percentage of patients who survived not requiring admission: (100 – [(IC6) + (IC7b-IC6) + (IC7a-IC7b)]). See indicator definitions in Table 2.4.
Source: OECD Pilot Data Collection on Integrated Care 2020-2021.

3.4. Recommendations for the next OECD data collection on Integrated Care

70. Given the lessons learnt with the pilot, and further methodological reflections to improve the international comparability for future data collections, the Expert Group advised taking the following actions for the next data collection (summarised in Box 3.2):

- **To cease data collection for haemorrhagic stroke indicators** while continuing to collect data for the ischaemic stroke indicators. The pilot collected data on readmission, mortality, and medicine prescription rates for patients discharged after stroke, distinguishing between ischaemic and haemorrhagic stroke. Given the differences in epidemiology, prognosis and approaches to disease management, the rates differed between the two diseases across and within the countries. Nevertheless, the results provided limited added value to the understanding of integrated care performance of health systems. Additionally, some countries could not provide stratified data for age, sex, and ICD code for haemorrhagic stroke, due to its relatively low prevalence and small patient population sizes, limiting further statistical analysis.
- **To cease data collection on subtypes of stroke (i.e. stratified ICD-10 code level) and collect data for ischaemic stroke.** The pilot used granular data stratified at ICD-10 code level for stroke indicators. This provided a deeper understanding of outcomes by different subtypes of ischaemic stroke. However, cell sizes were very small for certain sub populations such as young age groups with known low prevalence. Additionally, there are differences in coding practices across countries which limit the interpretability of the results when presented by ICD code. Therefore, for presentation of the data, collection of ICD-10 level data is not required.
- **To consider restricting data collection to age cohorts aged 45 and above.** The pilot included all patients aged 15 years and above, yet young ages showed low prevalence of stroke and CHF. The use of the disease specific standardisation population reduces the impact of the younger age group. Continuing to collect information for the population aged under 45 has the advantage of comprehensiveness. However it could be argued that populations aged under 45 require different management to the older cohorts, such as being more likely to have cardiomyopathy or adult congenital heart disease (Christiansen et al., 2017[83]). In the pilot data collection, younger populations were found to be far less likely to be prescribed anti-hypertensives than the older cohorts. This is consistent with some aetiologies not being treated with anti-hypertensives as first line management, for example adult congenital heart disease (Sabanayagam et al., 2018[84]). Moreover, further analysis for younger cohorts proves challenging given the small counts, sometimes a solitary individual, resulting in suppressions or the inability for countries to submit data. If there is increased effort or cost associated with the collection of this information, then consideration should be given to restricting the data collection. A counter argument is that the fastest increase in incidence of heart failure is in younger adults, and it will continue to increase with growing rates of obesity (Christiansen et al., 2017[83]).
- **To review and regularly consider revision of the medication list of prescribing indicators (i.e. IC4 and IC12).** Indicators on medicine prescription were defined to collect data only for the use of anti-hypertensives for stroke and CHF. These data allow comparisons across diseases of the use of anti-hypertensives to manage disease and support international comparison. The use of additional medications for specific conditions should also be considered, for example, the use of anti-thrombotic treatments for ischaemic stroke or other recommendations of medicines such as SGLT2 inhibitors for CHF being provided in addition to triple therapy (i.e. at least four medications). (Verma et al., 2021[85])
- **To consider amendment of the indicator specification of prescribing indicator for CHF (i.e. IC12).** The indicator specification of IC12 uses the ICD-10 CM coding system to identify patients with heart failure with reduced ejection fraction (HFrEF)- also referred to as systolic heart failure. Although the ICD-10 CM coding system allows identification of this group of patients, who should

systematically receive antihypertensive prescription, it is not used in most countries that participated in the data collection. While some countries discussed the possible future use of ICD-10 CM, an alternative indicator specification using ICD-10 (currently does not allow identification of those with HFrEF) is required to ensure it is feasible to calculate this indicator for all countries. Initially, estimating the cohorts with HFrEF and without HFrEF that are identified by using the case definition of IC9 in different countries would clarify the potential bias that may be associated with using a different population definition for IC12.

- **To amend the CHF 30 day mortality indicator (i.e. IC13) to explicitly refer to the same population as the other CHF integrated care indicators.** The population used for the 30-day mortality was in keeping with other 30 day hospital mortality definitions used by the OECD, but not in keeping with the population identified by the other integrated care indicators. Ensuring the use of the same population for IC9a would allow greater interpretation.
- **To encourage the further use of data linkage to calculate prescription indicators.** Only four countries were able to provide data for prescription rates after stroke and only two countries provided data for prescribing rates after CHF. Data on prescription rates of appropriate medication for secondary prevention 12 to 18 months after hospital discharge after stroke and CHF could provide insights over the variations in the quality of integration between hospital and community care and improve interpretability of readmission and mortality indicators.
- **To use the 2018 disease specific population as the reference population for standardisation.** Without standardisation, using crude rates, there is increased uncertainty when comparing between countries because of the differences in the age and sex breakdowns. 2018 disease specific population is recommended based on the analysis and other considerations presented in the paper.
- **To integrate mortality and readmission indicators in the regular OECD HCQO data collection while continuing to pilot medicine prescription indicators.** Most countries submitted mortality and readmission data while prescription data was available only for four countries. Therefore, mortality and readmission indicators for ischaemic stroke and CHF will be integrated in the regular OECD HCQO data collection. In parallel, there will be a review of medication list and data specification, and a continuation of the pilot data colelction for medicine prescription indicators.
- **Encourage data collection for longer time series to support trend analysis.** Most countries submitted data for the period between 2013 and 2018 and some countries also provided data for 2019 and 2020 allowing analysis of time trends within and across countries. As the results showed small variations over time, future analysis may demonstrate improvements that were not statistically significant in a short time series.

Box 3.2. Recommendations to improve international comparability of the next data collection

- To cease data collection for haemorrhagic stroke indicators and collect data for **ischaemic stroke** indicators alone, given the issues with low prevalence and small size populations for haemorrhagic stroke.
- To cease data collection stratified at ICD-10 level for **ischaemic stroke** indicators, given low prevalence for certain populations and countries.
- To redefine age cut-off to **45 years old and above** as data with younger cohorts prove challenging given the small counts, sometimes a solitary individual, resulting in suppressions or inability for countries to submit data.
- To regularly consider revision of medication list of prescription indicators as clinically appropriate (IC4 and IC12)). For example, other treatments such as anti-thrombotic agents for **ischaemic stroke** or four lines of therapy for **CHF**.
- To consider amending data specification of prescription indicator for **CHF** (i.e. IC12) after ensuring validity, given that it is not feasible for countries to calculate this data as it requires the use of ICD-10 CM.
- To amend the **CHF** 30 day mortality indicator (i.e. IC13) to explicitly refer to the same population as the other CHF integrated care indicators.
- To encourage more countries for the further use of **data linkage** to calculate prescription indicators in the next data collection.
- To use **2018 disease specific** population reference population for standardisation.
- To continue data collection for mortality and readmission indicators as part of the **regular HCQO data collection** and continue piloting medicine prescription indicators.
- To encourage data collection for longer **time series** to support trend analysis.

Source: Authors based on consultations with Experts.

4. The way forward

71. This report presented the results of the OECD Pilot on Integrated Care that took place in 2020-2021. This culminated in a *new generation* of integrated care indicators that used data linkage to support international comparisons of performance of integrated care delivery. The lessons learnt with the pilot call for further work on four fronts:

- (1) expanding work on indicator development by refining existing, and piloting new, quality and performance indicators;
- (2) performing policy analysis to better understand cross-country variations;
- (3) encouraging more countries to upscale data linkage and measure delivery of integrated care; and
- (4) developing measures of the level of integration of OECD health systems.

4.1. Expanding work on indicator development by refining existing and piloting new quality and performance indicators

72. Indicators have been developed to measure integrated care in relation to medication prescription and readmissions/case fatality one-year post discharge for key acute and chronic conditions (e.g. stroke and CHF). These indicators will be further refined in order to be routinely collected and to improve their international comparability as discussed in Section 3.4. This also includes acting on the outstanding methodological questions reflected in Section 3.3 that undermine internal validity, generalisability, and usefulness of readmission and mortality indicators to capture the performance of integrated care delivery.

73. Future rounds of data collections could consider the following three options:

- (1) ***Go broad***- by expanding work to other patient cohorts, conditions and diseases —such as asthma, COPD, diabetes, hip/knee fracture, cancer care, mental health and maternity care – or vulnerable people such as older people, people with multimorbidity could be added to the set of indicators;
- (2) ***Go deep***- by expanding work to consider longer care trajectories and further linkages to gain an understanding of patient trajectories along the health system, including before hospitalisation, for example, exploring data linkage with other key health data (including clinical registries, primary health care, hospital, outpatient care, prescribing data, PROMs / PREMs) to estimate the real world outcomes for a homogenous population across countries. Future work could also explore linkages between various key health and social care data such as long-term care and socioeconomic data, that could inform analysis of patterns of care for vulnerable people (e.g. long-term care residents, people suffering from mental health conditions, people with dementia, socioeconomically deprived people) or the whole population; and explore linkages between various

  (3) ***Go towards other dimensions***- by expanding work to consider other performance dimensions such as access, utilisation and cost. This could be achieved by developing indicator

measurement. For example, new indicators could aim to measure utilisation and timing of primary care and transitions of care from/to hospital to outpatient specialist care; average length of stay or delayed discharges. Further work could also involve using linked data to understand variation at a sub-national level.

74. Future work could examine the feasibility of expanding data collection in one or more of these directions: ***(1) go broad, (2) go deep and/or (3) go towards other dimensions***. This data could usefully inform pharmaceutical policy and regulatory changes, investments in multidisciplinary teams, and incentives for quality outcomes for patient populations.

4.2. Performing policy analysis to better interpret the findings of data collection of the integrated care indicators

75. Findings of the OECD pilot discussed in Section 3.2 call for more data and policy analysis to better interpret the cross-country variations and trend analysis. Cross-country variations in outcomes can be partly explained by differences in the organisation of care delivery, access to care and the contrasting quality of health information systems. To make this pilot data useful to inform policy action, this work requires more qualitative contextual data to be collected on the key features and policies affecting demand and supply of health care. This could help answer questions such as:

- How are countries resolving poor care integration and reorganising delivery of care, specifically for patients undergoing care for stroke and CHF?
- How contrasting is the quality of health information systems and performance monitoring across countries that may affect the data collected with this pilot?
- Which provider payment incentives have been adopted that promote care integration to stroke and CHF?

76. To answer these questions, policy analysis should be undertaken by mapping integrated care policies across OECD countries and reviewing system-level care integration innovations, particularly those spurred by COVID-19. This could include policies in the areas of governance and organisation of care delivery, data and information systems, and health financing both at the national and sub-national level.

77. Policy analysis could also help to gain additional information about outlier countries and contextual information to inform comparisons over multiple years. This analysis could also involve triangulating information from other OECD data collections (e.g. potentially preventable hospital admissions) to gain an understanding of policies that aid the design of effective systems of integrated care. By looking at similarities and differences across countries, this work could identify more efficient trajectories of care and their underlying policy settings. Comparisons across health systems may offer new knowledge regarding cost and quality differences. Comparisons may also create opportunities for improvement internationally as well as supporting countries to perform their own regional and country analysis over time to understand the impact of policy implementation and inform future policy development.

4.3. Encouraging more countries to upscale data linkage and measure delivery of integrated care

78. Future work can leverage on the existing capacity for countries to link patient-level data across various databases and multiple care settings. Recent OECD work on health data infrastructure shows that countries like **Belgium**, **France**, **Korea**, **Latvia**, the **Netherlands** and the **USA** are able to link hospital data to other data (e.g. clinical and death registries, outpatient and specialised care, pharmaceutical

prescribing) allowing measuring quality and outcomes across the entire treatment pathway (Oderkirk, 2021[53]).

79. While aiming to upscale data linkage for the next round of data collection, this work could also shed light on the limitations of current governance models that undermine the sharing of data among public authorities. It could also inform the ongoing work on the series of country reviews on health data infrastructure undertaken by the WP-HCQO[9].

4.4. Developing measures of the patient-centred level of integration of health systems

80. Findings of this pilot call for further policy analysis and more data in order to better interpret cross-country variations and trend analysis, as well as additional analysis using methods such as correlation analysis and panel data multivariate regression analysis. As integrated care is a multidimensional construct, a multifactorial approach is required to measure its performance. Therefore, and to improve actionability of international comparisons of the quantitative and qualitative data collected in this work, future work could also develop a better peer group comparisons (e.g. clustering) based on health systems characteristics allowing policy makers to make decisions with more confidence. However, given the heterogeneity between disease specific indicators as presented in this report, care should be taken in aggregating condition-specific indicators in a composite indicator aiming to reflect the integration of care delivery. Measures of level of integration of health systems could be improved with expanding the set of OECD Integrated Care indicators to quantify the patient-centred level of care integration by measuring, for example, the number of different providers visited in one year by a patient with specific health needs.

[9] For more information please see: https://www.oecd.org/health/health-data-infrastructure.htm

5. Annexes

Annex A. Rapid review of different meanings and mechanisms of "Integrated Care"

Box A. Rapid review of different meanings and mechanisms of "Integrated Care"

A vast literature discusses different meanings and mechanisms to integrate care referring to:

- Whether it is **horizontal or vertical integration**. The former consolidates services across organisations at the same stage in the delivery process (e.g. mergers of acute hospitals). The later brings together organisations at various service levels (e.g. primary and secondary care). In Finland, social and health care reform aims to bring primary care, community care, basic mental care, oral care, social care, outpatient rehabilitative care and some other specialist care services under the same management.
- Its **breadth**, ranging from integration for some individuals (e.g. package of preventive health interventions), specific diseases or population groups, or the whole population.
- The **time-span** of the continuity of care, since integration can be oriented towards a specific episode of care (e.g. post-surgical follow up), stages in a person's life cycle (e.g. new born care) or adopting a life-course approach (e.g. chronic conditions such as diabetes or mental health).
- Its **intensity**, ranging from partial integration, with non-binding linkages or ties between two sectors, to full integration, involving process of integrating health and social sectors into a new organisational model.
- Integrated **governance** by bringing together institutionalised mechanisms to enable cross-sectoral funding, regulation or service delivery. These mechanisms may occur at various levels: *system-level* when referring to rules and regulations across a given system; *organisation-level* relating to coordination of services across different providers and organisations; *professional-level* dealing with coordination of action across various health care professionals; and *clinical level* referring to care coordinated around a patient. These are also described at macro, meso and micro level: macro level referring to national strategies about priorities and policies; meso level referring to regional levels of implementation of specific programmes; and, micro level referring to the interface between the patient and health care services.

A literature review on the definitions identified over 150 overlapping definitions of integrated care (Armitage et al., 2009[86]). Varieties in definitions and mechanisms hampers the comparability of integrated care initiatives across countries and its expected outcomes. Terms such as *integrated care, coordination of care, continuing care, care pathway and seamless care* are used interchangeably while different views are reflected in these definitions, including those from patients, providers and policymakers. Table A.1. refers to common definitions identified in the literature following a rapid review.

Table A.1. Commonly used integrated care definitions

Author	Definition
(WHO Regional Office for Europe, 2016[87])	"Integrated health services delivery is defined as an approach to strengthen people-centred health systems through the promotion of the comprehensive delivery of quality services across the life-course, designed according to the multidimensional needs of the population and the individual and delivered by a coordinated multidisciplinary team of providers working across settings and levels of care. It should be effectively managed to ensure optimal outcomes and the appropriate use of resources based on the best available evidence, with feedback loops to continuously improve performance and to tackle upstream causes of ill health and to promote well-being through intersectoral and multisectoral actions."
(Contandriapoulos et al., 2003[88])	"Integrated health services: health services that are managed and delivered so that people receive a continuum of health promotion, disease prevention, diagnosis, treatment, disease-management, rehabilitation and palliative care services, coordinated across the different levels and sites of care within and beyond the health sector, and according to their needs throughout the life course."
(Lewis et al., 2010[89])	"I can plan my care with people who work together to understand me and my carer(s), allow me control, and bring together services to achieve the outcomes important to me."
(Kodner and Spreeuwenberg, 2002[90])	"Integration is a coherent set of methods and models on the funding, administrative, organizational, service delivery and clinical levels designed to create connectivity, alignment and collaboration within and between the cure and care sectors. The goal of these methods and models is to enhance quality of care and quality of life, consumer satisfaction and system efficiency for people by cutting across multiple services, providers and settings. Where the result of such multi-pronged efforts to promote integration lead to benefits for people the outcome can be called 'integrated care'"

Source: (WHO, 2016[27]; Leijten et al., 2018[28]; Nolte E and McKee M, 2008[91]; Curry and Ham, 2010[37]; Valentijn, 2016[92]; Lewis et al., 2010[89])

Growing body of knowledge about the policy enablers to integrated care

- WHO developed a conceptual framework on integrated, people-centred health systems that require five interwoven strategies to implement: 1) Engaging and empowering people and communities; 2) Strengthening governance and accountability; 3) Reorienting the model of care; 4) Coordinating the services within and across sectors; and 5) Creating an enabling environment (WHO, 2016[93]).
- The EU INTEGRATE project (Benchmarking Integrated Care for better Management of Chronic and Age-related Conditions in Europe) provided evidence on best practices for clinical delivery of integrated care enabled by data systems and health financing (Borgermans and Devroey, 2017[94]).
- The SELFIE project (Sustainable intEgrated care modeLs for multi-morbidity: delivery, FInancing and performancE) developed a new framework of integrated care for people living with multiple chronic conditions (Leijten et al., 2018[95]).
- The European Health Systems Assessment on Integrated Care Series provided a descriptive overview of integrated care initiatives in the European countries (European Commission, 2017[96]).

Annex B. OECD Expert Group on Integrated Care

Countries/ Organisations	Experts	Institution
Australia	Catherine Katz	Australian Commission on Safety and Quality in Health Care
	Heather Swanston	Australian Institute of Health and Welfare
	Lisa Murphy	Australian Commission on Safety and Quality in Health Care
	Clara Jellie	Australian Institute of Health and Welfare
Canada	Yana Gurevich	Canadian Institute for Health Information
	Yanyan Gong	Canadian Institute for Health Information
	Patricia Sullivan Taylor	Health Standards Organization and Accreditation Canada
	Gavin Brown	Health Canada / Government of Canada
Costa Rica	Adriana Salazar	Ministry of Health
Denmark	Katrine Bonde	The Danish Health Data Authority
	Jan Nørholm Mainz	Psychiatry – The North Denmark Region
	Trine Toft Sørensen	The Danish Health Data Authority
Estonia	Merike Rätsep	National Institute for Health Development
Finland	Unto Häkkinen	Finnish Institute for Health and Welfare
	Mikko Peltola	
France	Linda Banaei-Bouchareb	Haute Autorité de Santé
	Candice Legris	Haute Autorité de Santé
Germany	Amelung Volker	Institut für Epidemiologie, Sozialmedizin und Gesundheitssystemforschung Medizinische Hochschule Hannover
Israel	Ziona Haklai	Ministry of Health
	Yael Applbaum	Ministry of Health
	Shumalit Gordon	Ministry of Health
Italy	Giovanni Baglio	The Italian National Agency for Regional Healthcare Services (AGENAS)
	Modesta Visca	Sanita
	Roberto Blaco	Sanita
	Elisa Guglielmi	The Italian National Agency for Regional Healthcare Services (AGENAS)
Japan	Tsuguya Fukui	Tokyo Medical University Ibaraki Medical Center
	Gen Shimada	St. Luke's International University
	Osamu Takahashi	St. Luke's International University
	Sachiko Ohde	St. Luke's International University
	Chika Horikawa	St. Luke's International University
	Kimi Estela Kobayashi-Cuya	St. Luke's International University
Netherlands	Ronald Gijsen	National Institute for Public Health and the Environment
	Sil Brukx	National Institute for Public Health and the Environment
Norway	Anja Lindman	Norwegian Institute of Public Health
	Katrine Skyrud	Norwegian Institute of Public Health
	Julie Kjelvik	The Norwegian Directorate of Health
	Doris Tove Kristoffersen	Norwegian Institute of Public Health
Portugal	Anabela Coelho	Lisbon School of Health Technology
	Claudia Borges	Health System Central Administration – ACSS
	Carla Pereira	Directorate General for Health
Singapore	Ahmad Haikal Malek	Ministry of Health
	Matthew Niti	Ministry of Health
	Wei Ying Mok	Ministry of Health
	Heng Pei Lee	Ministry of Health
	Wei Ting Teo	Ministry of Health

	Omela Ng Ruth Lim Hijanah Mohd Jailani Zhaojing Goh Delia Teo Kok Mun Foong Adelina Young Wang XiaoJie Maikal Malek	Ministry of Health Ministry of Health Ministry of Health Ministry of Health Ministry of Health Ministry of Health Ministry of Health Ministry of Health Ministry of Health
Slovenia	Mircha Poldrugovac Jerneja Farkaš Lainščak Mitja Lainščak	Ministry of Health General Hospital Murska Sobota and National Institute of Public Health General Hospital Murska Sobota and Faculty of Medicine, University of Ljubljana
Sweden	Max Köster Martin Lindblom Mikaela Svensson	National Board of Health and Welfare National Board of Health and Welfare National Board of Health and Welfare
Turkey	Hande Hacimahmutoglu Yıldız Erkmen Seyithan Yildirak Ayşe Sofuoglu Mihriban Tag Dilek Tarhan Seval Ciftci Ayfer Erdogan Alptekin	Presidency of Strategy and Budget of the Presidency of Turkey Presidency of Strategy and Budget of the Presidency of Turkey Presidency of Strategy and Budget of the Presidency of Turkey Presidency of Strategy and Budget of the Presidency of Turkey Presidency of Strategy and Budget of the Presidency of Turkey Department of Quality, Accreditation and Employee Rights, Ministry of Health Accreditation and Employee Rights, Ministry of Health Department of Quality, Accreditation and Employee Rights, Ministry of Health
United Kingdom	Abigail Bradshaw Charlotte McArdle Caroline Lecky Sandra Aitcheson Mary Frances McManus	Department of Health and Social Care (England) Department of Health (Northern Ireland) Public Health Agency (Northern Ireland) Public Health Agency (Northern Ireland) Department of Health (Northern Ireland)
United States of America	Steve Sheingold Marko Mijic	Office of the Assistant Secretary for Planning and Evaluation California Health and Human Services
International organisations/research centres		
European University Hospitals Alliance		
International Population Data Linkage Network	Merran Smith	
HealthPROS	Damir Ivankovic	
Optimedis	Nicolas Larrain	
Institute Research And Documentation In Economy De La Santé	Zeynep Or	
Harvard/London School of Economics ICCONIC project	Irene Papanicolas Jose Figueroa	
Hertie School/Robert Bosch Foundation	Mujaheed Shaikh	

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