

NEW HORIZONS

New horizons in the role of digital data in the healthcare of older people

JANE A.H. MASOLI^{1,2}, OLIVER TODD³, JENNIFER K. BURTON⁴, CHRISTOPHER WOLFF², KATHERINE E. WALESBY⁵, JONATHAN HEWITT⁶, SIMON CONROY⁷, JAMES VAN OPPEN⁸, CHRIS WILKINSON^{9,10}, RUTH EVANS³, ATUL ANAND¹¹, JOE HOLLINGHURST¹², CINI BHANU⁶, VICTORIA L. KEEVIL¹³, EMMA R.L.C. VARDY^{14,15}, The Geridata Group

¹Department of Clinical and Biomedical Sciences, University of Exeter, Exeter, UK

²Healthcare for Older People, Royal Devon University Healthcare NHS Foundation Trust, Exeter, UK

³Academic Unit for Ageing and Stroke Research, University of Leeds, Leeds, UK

⁴School of Cardiovascular & Metabolic Health, University of Glasgow, Glasgow, UK

⁵Alzheimer Scotland Dementia Research Centre, University of Edinburgh, Edinburgh, UK

⁶School of Medicine, Cardiff University, Cardiff, UK

⁷Medical Research Council (MRC) Unit for Lifelong Health and Ageing, University College London, London, UK

⁸Department of Population Health Sciences, University of Leicester, Leicester, UK

⁹Hull-York Medical School, University of York, Heslington, UK

¹⁰Academic Cardiovascular Unit, South Tees NHS Foundation Trust, Middlesbrough, UK

¹¹Centre for Cardiovascular Science, University of Edinburgh, Edinburgh, UK

¹²Swansea University Medical School, Swansea University, Swansea, UK

¹³Department of Medicine, University of Cambridge, Addenbrooke's Hospital, Cambridge, UK

¹⁴Department of Ageing and Complex Medicine, Salford Care Organisation, Northern Care Alliance NHS Foundation Trust, Salford, UK

¹⁵Manchester Academic Health Science Network, School of Health Sciences, and National Institute of Health and Care Research (NIHR) Applied Research Collaboration Greater Manchester, University of Manchester, Manchester, UK

Address correspondence to: Emma R. L. C. Vardy, Tel: 0044 161 2064048. Email: emma.vardy@nca.nhs.uk

Abstract

There are national and global moves to improve effective digital data design and application in healthcare. This New Horizons commentary describes the role of digital data in healthcare of the ageing population. We outline how health and social care professionals can engage in the proactive design of digital systems that appropriately serve people as they age, carers and the workforce that supports them.

Keywords: digital, data, older people, frailty, workforce

Key Points

- Healthcare improvements have resulted in increased population longevity and hence multimorbidity.
 - Shared care records to improve communication and information continuity across care settings hold potential for older people.
 - Data structure and coding are key considerations.
 - A workforce with expertise in caring for older people with relevant knowledge and skills in digital healthcare is important.
-

Introduction

The twentieth century saw the largest gain in life expectancy in history [1, 2]. The prevalence of non-communicable disease and the resources required to maintain life and reduce disability have dramatically increased [2, 3]. The Global Burden of Disease Study 2010 reports that whilst age specific mortality has been falling, the burden of chronic disability is rising [4].

Healthcare improvements have resulted in increased population longevity. Whilst older people are likely to be healthier than in the past, [5] they are more likely to live with multimorbidity (two or more conditions) [6]. Multimorbidity is estimated to affect over a third of adults globally and over half of people aged over 60 years old [7], with a higher prevalence in the most deprived communities. The interplay of increasing health complexity and increased social care needs as people age frequently results in multiple health and social care providers. These care interactions generate an increasing volume of data commonly in multiple separate systems [8]. In this paper, we will explore the current landscape, challenges and future considerations around digitally generated healthcare data concerning older people and the implications for the health and social care workforce.

Electronic health and social care records

The wide variation in healthcare systems globally is echoed in the progress in electronic health and social care records. The need for improved joined-up data in health and social care is recognised by policymakers, and a global strategy on digital health has been recommended by the World Health Organization (WHO) [9]. The Global Digital Health Partnership (GDHP) is a collaboration of governments and the WHO, formed to support the effective implementation of digital health services [10]. Models for progressing the evolution of electronic health and social care records vary, but it is important to leverage digital health advancements globally. It is important to consider informed consent for information sharing in digital healthcare records within a clear governance framework [11]. Improved digital records and communication may be particularly important in caring for older people, who have increased healthcare utility and complexity and are vulnerable to adverse outcomes [12].

One key aspect of digitalisation is interoperability between health and social care providers. Interoperability is defined as the ability of a system or product to transfer meaning of information within and between systems or products without special effort on the part of the user [10]. Standardised clinical coding systems facilitate interoperability and improve data quality. A lack of structure and standardisation can be a barrier to effective use of electronic health records and can compromise data quality and validity. Electronic records enable detailed clinical coding that relates to the International Statistical Classification of Diseases and Related Health Problems (ICD), which is now on its 11th version: ICD 11 [13]. Standardised coding enables

data to be used efficiently for public health surveillance, quality and cost evaluation. Whilst digital platforms and software vary, standardised coding approaches combined with increased agility provide the potential for replicating extraction systems across different clinical digital providers, creating more real-time feed in and interpretation than has been feasible previously. There are economic barriers to data standardisation, through direct costs such as software or indirect costs such as training or additional time taken in consultations [10].

There are important limitations of reliance on coded data to measure performance. The data validity should be considered in analyses, particularly when associated with financial reimbursement [14]. This can still be problematic within free at the point of care healthcare systems such as the National Health Service (NHS) in the UK; standardised care meeting set quality criteria are rewarded, whereas person-centred deviation from guidelines, such as in frailty or multimorbidity, can incur financial penalties to providers [15]. There is ongoing work to define how to measure the impact of digitalisation by the GDHP. Whilst the direct impact of improved digital healthcare data on clinical outcomes in ageing has not been established to our knowledge, it is a key aspect of international examples of integrated care delivery in frailty and multimorbidity [16, 17].

Patient held records

The WHO emphasises the importance of person-centred digitalisation [9]. Patient held records are an attractive option for transfer of information and patient engagement in patient held records. For example, in Australia, 'My Health Record' is a secure online summary of key patient health information, which patients and healthcare providers can use to collate healthcare information [18]. As with many electronic healthcare records globally, there was a surge in use of the system with COVID to provide vaccination status. There are now more than 23.5 million My Health Record—over 90% population coverage. The meaningful use of personal health records requires end user and health and social care use: 95% of public healthcare services are using My Health Record, but only 14% of private health services [18]. There are also effective examples of increased digitalisation in middle and lower income countries. For example, Uruguay has developed a National Electronic Clinical Record, which is in place for ~80% of the population and enables improved continuity of information [19]. The appropriate flow of information to patient held records should be considered, as early access to results without clinical interpretation can impact on patients [20].

Patient held records require population level digital upskill. Older adults are more likely to be digitally excluded than any other group, with around a third never having used the internet [21]. Barriers to digital inclusion are also clustered in minority ethnic groups, related to low digital literacy and financial hardship [22]. A distinction between 'un-problematic non-use' of the internet and genuine digital

exclusion must be made in considering how patient held records might be utilised by older people. It should not be presumed that older people are unable to use digital resources and Portz *et al.* [23] found that older adults were in fact interested in using patient portals, but careful consideration in relation to aspects such as usefulness and ease of use were required. A study by Lenca *et al.* [24] confirmed that older people view digital technologies positively if they contribute overall positively to general wellbeing, and especially if designed in a patient-centred manner. There are also positive examples of digital enabling, for example, the Digital Heroes scheme in Wales in which confident users of tech can support others to get online [25].

Frailty

Proactive identification of people with frailty in both primary and secondary care can trigger Comprehensive Geriatric Assessment (CGA), shown to improve patient care and outcomes [26]. Frailty registers are used variably, with some exemplars ensuring real-time updates and continuity of advanced care plan and primary secondary care interface communication, such as alerts on hospital admission. Identification of frailty by electronic health record screening is used to support claims data in the USA and Canada, with a range of frailty prediction models used, some of which lack robust validation studies [27].

In the UK, frailty screening was introduced in the 2017/18 General Practitioner (GP) contract. This has largely been implemented via the electronic frailty index (eFI), which uses routine primary care data to generate a cumulative deficit score based on 36 conditions to predict those at highest risk of frailty. It generates categories of non-frail and mild, moderate or severe frailty. The eFI was predictive of care home and mortality outcomes in derivation data from England [28] and has since been validated in primary care data sets from Scotland, Wales and Australia [27, 29, 30]. The identification of people living with frailty can help clinicians and commissioners to review and plan service provision to better meet their patients' needs.

Older people have higher rates of hospital admission: in 2021–22, people aged over 75 years old comprised 27% of hospital admissions in England [31], where quality standards for frailty mandate screening for frailty within 30 min of unplanned hospital attendance [32]. Currently, this is mainly done through assessment of the patient using the Rockwood Clinical Frailty Scale (CFS) [33]. Whilst the CFS is based on clinical judgement, the documentation can be optimised in the digital record through the use of digital forms or smart phrases, supported by frailty training. The Hospital Frailty Risk Score is based on harnessing and subsequently validating NHS hospital admission data and can aid proactive identification of frailty in secondary care [34], as well as enabling a dashboard for frailty benchmarking.

Electronic patient data are being used in a variety of ways to support the identification and care of people with

frailty but have limitations when used in isolation. Clinical corroboration can add to the validity of frailty coding [27]. The Pathfields Tool is an example of an adaptation of eFI combined with additional use of primary care data to support the identification of those with frailty by integrating additional variables such as residing in a care home, having received a home visit in the last year and having difficulty mobilising at annual review [35]. A key aspect of this tool was that the healthcare team were asked if a patient was notably slower at walking or struggling to stand compared with a fit or well person at a similar age. These data would not have been available in the derivation and validation data for the eFI and add important granularity, showing the utility of integrating clinical judgement and corroboration into an otherwise data-driven risk assessment. The eFI and Hospital Frailty Risk Score both identify cohorts of older people at risk of adverse outcomes during and following an acute hospital admission, but the correlation between the scores is low [36]. Whilst recognition of frailty can be improved through these tools, the impact on individuals identified as frail requires further research.

Comprehensive Geriatric Assessment

There is good evidence supporting the use of CGA in the care of older people with frailty [26]. This involves multidimensional assessment by a multi-professional team to support a patient-focussed management plan [37]. A single multidisciplinary digital care plan is proposed in the Getting It Right First Time (GIRFT) geriatric medicine report [38], removing the need for multiple assessments and conversations, but this would need considerable cultural and infrastructural changes [27] to standardise recording of clinical assessments. By harnessing digital capability, in the future, CGA continuity could be more feasible across primary, secondary, social care and community practice, as well as benefitting from information from older people and their carers through remote digital communication and assessment [59]. There are examples of successful digital CGA combined with clinical assessment. Aronoff-Spencer *et al.* [39] developed a digital CGA and referral system linking medical, dental and psychosocial needs by real-time CGA-derived metrics for 996 older adults (age ≥ 60) was implemented as part of a continuous quality improvement project. Successful digital CGA should be appropriate to the specific health service and population requirements.

The UK context

Approximately 98% of the UK population are registered with the NHS [40], making it potentially more amenable to aligned digital transformation than other more disparate health systems with higher use of private providers. However, health and social care data are captured across multiple systems, typically with separate primary and secondary care, mental health and social care records, which duplicate

information and rarely cross-populate or update between records. The GIRFT report found wide variations in how well data pertaining to geriatric medicine and frailty was used between healthcare organisations [38]. With well-planned digital structure, digital tools can be integrated to measure existing practice against national quality standards, highlight inadequacies, identify priority areas, prioritise patient safety and support improvements in care. Policymakers across the UK have published digital plans for health and social care data that aim to make rapid progress in digitalisation of healthcare records [41, 42]. The importance of leveraging healthcare data for optimisation of patient safety, clinical services and research is well recognised [43, 44].

The Professional Records Standards Body (PRSB) provides guidance on care record minimum standards to ensure that the right information is recorded correctly and can be easily accessed [45]. This provides a framework for secure data sharing that ensures adherence to the UK General Data Protection Regulations. The PRSB has published guidance on key stages of transfer of information in the patient journey, including the core information that can be shared, referral to secondary care, discharge from hospital, emergency care, care homes and end of life care. Importantly, the PRSB recommends the inclusion a person-focussed section, which includes a record of the things that a person feels it is important to communicate about their needs, strengths, values, concerns and preferences to others providing support and care [45]. This places person-centred care at the forefront of the digital record and Patient-Reported Outcome Measures (PROMs) are now being measured routinely in some areas of healthcare [46, 47].

Improved digital records and interoperability could support monitoring and quality improvement of acute and chronic disease in the NHS, currently limited by the validity and completeness of digital records [41]. There is the potential for streamlining of population of specific national audits relevant to geriatric medicine, such as the Sentinel Stroke National Audit Programme, the National Hip Fracture Database and the National Dementia Audit, which are labour intensive and subject to transcribing errors through manual data transfer. Data dashboards, such as those maintained by the NHS benchmarking network [48] and NHS digital [49], can aid data visualisation for scrutiny by clinicians, commissioners and outside bodies such as the Care Quality Commission. The National Commissioning Data Repository portal combines data and intelligence to provide an overview of activity and spend in dashboard format. The most clinically useful dashboards should assimilate information from different sources across the health and care system and present it clearly for interpretation. A theograph is a visual representation of the contacts that individual patients have with health and care services over a period of time. Theographs can illustrate the increasing intensity of care provision (health or social), which can be a signal that more assertive and holistic case management is required.

Shared care records are recommended as a quality standard for people with multiple long-term conditions or living with frailty, [13, 50] supported by NHS England and NHS Digital [51]. This would ideally populate key information for the individual from primary and secondary care, as well as mental health and social care providers. A shared care record may be more feasible in areas with joined up health and care services via integrated care systems (ICS), such as those used in Leeds (<https://www.leedscarerecord.org/>) and Manchester (<https://gmwearebettertogether.com/>). Shared care records can also be used for standardising advanced care plan communications, such as the Red Bag pathway in Sutton [52]. Federated data platforms are being developed to share operational and planning data to inform interventions and foster collaboration, with each trust and ICS having a federated platform which will work alongside their existing systems [53].

Social care digital recording remains limited, with 45% still using paper-based records [41]. Research is helping to inform digitalisation in caring for people as they age. One example is the Developing research resources And Minimum data set for Care Homes' Adoption and use (DACHA) study (Box 1) [54]. A key goal of DACHA is to combine data generated within the care home with existing routinely-collected health and social care data, reducing the burden on care home staff.

Box 1: DACHA

- The DACHA study (Developing research resources And Minimum data set for Care Homes' Adoption and use) aims to synthesise existing evidence and data sources with care home-generated resident data to deliver a minimum data set (MDS) that is usable and authoritative for different stakeholders [58].
- Although UK care homes collect and manage significant amounts of detailed data about the individuals they support, there is a lack of meaningful joined-up data about those living in care homes at a national and regional level [59].
- Although the NHS and local authorities generate and hold information about care home residents, often this is not shared with the care home.
- The MDS will be tested in a pilot feasibility study in three regions of England [1].
- In addition to learning from the practical, technical and information governance requirements of linking these data, focus groups and interviews with care home staff and external stakeholders will be used to explore implementation and perceived value of such an MDS in a UK care home context.
- Nine core principles have been developed to inform development, the first of which is to ensure the MDS must primarily focus on measuring what matters most to support those living in care homes through systematic data collection and sharing [54].

- There is a risk of national and regional data about care home residents being dominated by health measures because of lack of availability of data that is not health data.
- A wider range of data is needed to understand the heterogeneity and diversity within the care home sector, supporting older adults with complex needs in context.

Workforce development

To develop digital records and systems suitable for older people it is vital that health and social care professionals are upskilled in digital healthcare to support transformation.

The importance of healthcare workforce digital upskilling is included in both the Topol and the Goldacre reviews [44, 55], which recommend embedding digital learning into essential clinical training. We should be supporting and driving this as early training of people with enhanced digital skills will allow them to enter the workforce empowered to support digital change.

Globally, there are opportunities for digital leadership training and roles in healthcare systems at organisational, regional and national levels. In the UK, qualifications in digital healthcare leadership are available, including those provided by the NHS Digital Academy, which is a partnership between Health Education England and NHSX [56]. There are also opportunities for work placements with NHS Digital. The UK lacks an established career pathway to develop senior digital leaders, but this is becoming better defined through the work of the Faculty of Clinical Informatics and the Chief Clinical Informatics Officer campaign supporting the appointment of senior clinicians in the NHS, both medical and nursing, to informatics roles including representation at board level. There are increasing opportunities for digital fellowships to be integrated with clinical training, particularly as hospital seeks clinical input into digital transformation.

Collaboration with business analysts and data scientists is important to share tools, case examples and resources, to design digital systems and services that meet the needs of older people. The Geridata network [57] is a collaborative of data analysts, clinicians and researchers working in the digital space to enhance the care of older people and is supported by the British Geriatrics Society. A key aim of this collaborative is to develop a platform for comparison of outcomes in older people using different healthcare data sets. Comparison between different pathways and systems of care in various regions and countries would allow us to better understand which models of geriatric care are best performing to share best practice and drive quality improvement.

Conclusion

Digitalisation of health and social care systems globally has been prioritised and progress accelerated as a result of the COVID-19 pandemic. The value of accessible, joined-up, high quality data has been recognised and there is momentum in working towards digitally integrated health and social care systems. This period of rapid digital transformation is an opportunity to optimise system changes to ensure that they truly align with the needs of providing health and social care for people as they age. This is vital for both high quality clinical care and to facilitate high quality research. Geriatricians and other professionals involved in the care of older people need to be involved at highest level, to advocate on behalf of those they care for. Digital transformation must include health and social care professionals who understand the complexity of caring for older people and are able to engage older people in systems change. Such transformation will require sufficient investment to realise potential benefits and ensure interoperability.

This is a call to action for geriatricians and other health and social care professionals working in the care of older people to upskill and lead digital development in the UK and globally to ensure that systems are co-designed to support the requirements of older adults and our workforce.

Acknowledgements of Collaborative Authorship: The Geridata group is: Atul Anand, Jennifer Kirsty Burton, Cini Bhanu, Matthew Butler, Andrew Clegg, Jemima Tunung Collins, Simon Conroy, Richard Dodds, Ruth Evans, Stephanie Harrison, Jonathan Hewitt, Joe Hollinghurst, Daniel Jones, Victoria L Keevil, Jane Masoli, Lara Mitchell, James van Oppen, Marc Osterdahl, Terry Quinn, Oliver Todd, Emma Vardy, Katherine Walesby and Chris Wilkinson.

Declaration of Conflicts of Interest: C.W. has received research funding from Bristol Myer Squibb. E.R.L.C.V. has received speaker honoraria from GE healthcare.

Declaration of Sources of Funding: J.A.H.M. is funded by the National Institute for Health and Care Research (NIHR) (NIHR302270 Advanced Fellowship). O.T. is funded as an academic clinical lecturer funded by the National Institute for Health Research (NIHR). J.K.B. is a funded co-applicant on the DACHA study that is funded by the NIHR Health and Social Care Delivery Research programme (NIHR 127234). K.E.W. is supported by clinical research fellowships from Alzheimer Scotland and The University of Edinburgh Centre for Cognitive Ageing and Cognitive Epidemiology, part of the cross council Lifelong Health and Wellbeing Initiative (MR/L501530/1). Funding from the Biotechnology and Biological Sciences Research Council (BBSRC) and Medical Research Council (MRC) is gratefully acknowledged. J.v.O. received funding from National Institute for Health and Care Research (NIHR) Doctoral Research Fellowship 300901. V.L.K. is funded by

an MRC/NIHR Clinical Academic Research Partnership Grant (CARP; grant code: MR/T023902/1). E.R.L.C.V. has time funded by the National Institute for Health (NIHR) Applied Research Collaboration (ARC) Greater Manchester and the NIHR Clinical Research Network Greater Manchester hosted through Manchester University hospitals NHS Foundation Trust. She also holds an Honorary Clinical Chair through the Manchester Academic Health Sciences Centre, School of Health Sciences, Faculty of Biology, Medicine and Health, University of Manchester. The Ageing Data Research Collaboration (@geridata) is supported by the British Geriatrics Society. The views expressed in this publication are those of the author(s) and not necessarily those of the NIHR, NHS, Universities or the UK Department of Health and Social Care.

References

1. Frenk J. Reinventing primary health care: the need for systems integration. *Lancet* 2009; 374: 170–3.
2. The World Health report: Health Systems: Improving Performance. 2000. Available at: <https://apps.who.int/iris/handle/10665/42281>. (accessed 3 October 2022).
3. Cylus J, Richardson E, Findley L, Longley M, O'Neill C, Steel D. United Kingdom: health system review. *Health Syst Transit* 2015; 17: 1–126. Available at: <https://pubmed.ncbi.nlm.nih.gov/27049966/> (accessed 21 September 2022).
4. Murray CJL, Richards MA, Newton JN *et al.* UK health performance: findings of the Global Burden of Disease Study 2010. *Lancet* 2013; 381: 997–1020.
5. McKee M, Dunnell K, Anderson M *et al.* The changing health needs of the UK population. *Lancet* 2021; 397: 1979–91.
6. Beard JR, Officer A, de Carvalho IA *et al.* The world report on ageing and health: a policy framework for healthy ageing. *Lancet* 2016; 387: 2145–54.
7. Chowdhury SR, Chandra Das D, Sunna TC, Beyene J, Hossain A. Global and regional prevalence of multimorbidity in the adult population in community settings: a systematic review and meta-analysis. *EClinicalMedicine* 2023; 57: 101860. <https://doi.org/10.1016/J.ECLINM.2023.101860>.
8. Cassell A *et al.* The epidemiology of multimorbidity in primary care: a retrospective cohort study. *Br J Gen Pract* 2018; 68: e245–51. <https://doi.org/10.3399/BJGP18X695465>.
9. World Health Organization. Global strategy on digital health 2020–2025. World Health Organization 2021. Available at: <https://apps.who.int/iris/handle/10665/344249>. (accessed 23 July 2023).
10. Global Digital Health Partnership. Available at: <https://gdhp.health/> (accessed 23 July 2023).
11. Heslop PA, Davies K, Sayer A, Witham M. Making consent for electronic health and social care data research fit for purpose in the 21st century. *BMJ Health Care Inform* 2020; 27: e100128. <https://doi.org/10.1136/BMJHCI-2020-100128>.
12. Boyd PJ, Nevard M, Ford JA, Khondoker M, Cross JL, Fox C. The electronic frailty index as an indicator of community healthcare service utilisation in the older population. *Age Ageing* 2019; 48: 273–7.
13. International Classification of Diseases 11th Revision. Available at: <https://icd.who.int/en> (accessed 25 January 2023).
14. Portuondo JI, Harris AHS, Massarweh NN. Using administrative codes to measure health care quality. *JAMA* 2022; 328: 825–6.
15. Qualities and Outcomes Framework 2021–22. NHS Digital. Available at: <https://qof.digital.nhs.uk/> (accessed 8 November 2022).
16. Leijten FRM, Struckmann V, van Ginneken E *et al.* The SELFIE framework for integrated care for multi-morbidity: development and description. *Health Policy Educ* 2018; 122: 12–22.
17. Bower P, Reeves D, Sutton M *et al.* Improving care for older people with long-term conditions and social care needs in Salford: the CLASSIC mixed-methods study, including RCT. *Health Serv Deliv Res* 2018; 6: 1–188.
18. My Health Record Statistics, Australian Digital Health Agency. Available at: <https://www.digitalhealth.gov.au/initiatives-and-programs/my-health-record/statistics> (accessed 16 March 2023).
19. How is Uruguay digitizing its health system? Inter-American Development Bank. Available at: <https://www.iadb.org/en/improvinglives/how-uruguay-digitizing-its-health-system> (accessed 16 March 2023).
20. Silberner J. Access to records: do open notes work for patients? *BMJ* 2023; 381: p789. <https://doi.org/10.1136/BMJ.P789>.
21. Older people's access to digitalised services. National Institute for Health and Care Research Applied Research Collaboration Greater Manchester, 2021. Available at: <https://arc-gm.nihr.ac.uk/media/page-images/ARC/HealthyAgeing/DIBriefingNote06Jan2022.pdf> (accessed 22 July 2023).
22. Poole L, Ramasawmy M, Banerjee A. Digital first during the COVID-19 pandemic: does ethnicity matter? *Lancet Public Health* 2021; 6: e628–30. [https://doi.org/10.1016/S2468-2667\(21\)00186-9](https://doi.org/10.1016/S2468-2667(21)00186-9).
23. Portz JD, Bayliss EA, Bull S *et al.* Using the technology acceptance model to explore user experience, intent to use, and use behavior of a patient portal among older adults with multiple chronic conditions: descriptive qualitative study. *J Med Internet Res* 2019; 21: e11604. <https://doi.org/10.2196/11604>.
24. Ienca M, Schneble C, Kressig RW, Wangmo T. Digital health interventions for healthy ageing: a qualitative user evaluation and ethical assessment. *BMC Geriatr* 2021; 21: 1–10.
25. Digital Heroes, Digital Communities Wales. Available at: <https://www.digitalcommunities.gov.wales/digital-heroes/> (accessed 16 March 2023).
26. Ellis G *et al.* Comprehensive Geriatric Assessment for older adults admitted to hospital. *Cochrane Database Syst Rev* 2017; 2017: CD006211. <https://doi.org/10.1002/14651858.CD006211.PUB3>.
27. Kim DH. Measuring frailty in health care databases for clinical care and research. *Ann Geriatr Med Res* 2020; 24: 62–74.
28. Clegg A, Bates C, Young J *et al.* Development and validation of an electronic frailty index using routine primary care electronic health record data. *Age Ageing* 2016; 45: 353–60.
29. Devereux N, Ellis G, Dobie L, Baughan P, Monaghan T. Testing a proactive approach to frailty identification: the electronic frailty index. *BMJ Open Qual* 2019; 8: e000682. <https://doi.org/10.1136/BMJQ-2019-000682>.
30. Hollinghurst J, Fry R, Akbari A *et al.* External validation of the electronic frailty index using the population of Wales within the secure anonymised information linkage databank. *Age Ageing* 2019; 48: 922–6.

31. Hospital Admitted Patient Care Activity, 2021–22, NHS Digital. Available at: <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2021-22> (accessed 22 September 2022).
32. Unplanned Hospital Care Acute Frailty Service Specifications-Guidance Document (London), Link via British Geriatrics Society Frailty Hub. Available at: <https://www.bgs.org.uk/resources/frailty-hub-setting-up-and-developing-frailty-services> (accessed 12 March 2023).
33. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, Mitnitski A. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;173: 489–95. <https://doi.org/10.1503/cmaj.050051>. Available at: <https://www.dal.ca/sites/gmr/our-tools/clinical-frailty-scale.html> (accessed 22 September 2022).
34. Gilbert T, Neuburger J, Kraindler J *et al.* Development and validation of a hospital frailty risk score focusing on older people in acute care settings using electronic hospital records: an observational study. *Lancet* 2018; 391: 1775–82.
35. Attwood D, Boorer J, Ellis W *et al.* The Pathfields tool: a frailty case-finding tool using primary care IT—implications for population health management. *Age Ageing* 2020; 49: 1087–92.
36. Hollinghurst J, Housley G, Watkins A, Clegg A, Gilbert T, Conroy SP. A comparison of two national frailty scoring systems. *Age Ageing* 2021; 50: 1208–14.
37. Parker SG, McCue P, Phelps K *et al.* What is Comprehensive Geriatric Assessment (CGA)? An umbrella review. *Age Ageing* 2018; 47: 149–55.
38. Hopper A. Geriatric Medicine GIRFT Programme National Specialty Report, 2021. Available at: https://gettingtrighfirsttime.co.uk/medical_specialties/geriatric-medicine/ (accessed 22 July 2023).
39. Aronoff-Spencer E, Asgari P, Finlayson TL *et al.* A comprehensive assessment for community-based, person-centered care for older adults. *BMC Geriatr* 2020; 20: 1–12.
40. Wolf A, Dedman D, Campbell J *et al.* Data resource profile: Clinical Practice Research Datalink (CPRD) Aurum. *Int J Epidemiol* 2019; 48: 1740. <https://doi.org/10.1093/ije/dyz034>.
41. A plan for digital health and social care. NHS England 2022. Available at: <https://www.gov.uk/government/publications/a-plan-for-digital-health-and-social-care/a-plan-for-digital-health-and-social-care#our-starting-point> (accessed 21 September 2022).
42. NHS Long Term Plan. National Health Service (NHS) England 2019. Available at <https://www.longtermplan.nhs.uk/online-version/> (accessed 23 July 2023).
43. Data saves lives: reshaping health and social care with data. UK Department of Health and Social Care 2022. Available at: <https://www.gov.uk/government/publications/data-saves-lives-reshaping-health-and-social-care-with-data/data-saves-lives-reshaping-health-and-social-care-with-data> (accessed 3 October 2022).
44. Better, broader, safer: using health data for research and analysis. UK Department of Health and Social Care 2022. Available at: <https://www.gov.uk/government/publications/better-broader-safer-using-health-data-for-research-and-analysis> (accessed 3 October 2022).
45. Professional Records Standards Body. 2022. Available at: <https://theprsb.org/> (accessed 21 September 2022).
46. Patient Reported Outcome Measures (PROMs). NHS Digital. Available at: <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/patient-reported-outcome-measures-proms> (accessed 31 October 2022).
47. PROMs Standard Operating Model (PSOM). Welsh Value in Health Centre. Available at: <https://vbhc.nhs.wales/digital-health/data-products/proms-standard-operating-model-psom/> (accessed 31 October 2022).
48. NHS Benchmarking Network - Raising standards through sharing excellence, providing evidence and insight. National Health Service. Available at: <https://www.nhsbenchmarking.nhs.uk/> (accessed 22 September 2022).
49. Data dashboards. NHS Digital. Available at: <https://digital.nhs.uk/dashboards> (accessed 22 September 2022).
50. Social care for older people with multiple long-term conditions, National Institute for Health and Care Excellence. Quality Standard 132. 2016. Available at: <https://www.nice.org.uk/guidance/qs132> (accessed 23 July 2023).
51. Digital Change in Health and Social Care. The Kings Fund 2018. Available at: <https://www.kingsfund.org.uk/publications/digital-change-health-social-care> (accessed 23 July 2023).
52. Developing the e-Red Bag. NHS Digital. Available at: <https://digital.nhs.uk/services/social-care-programme/demonstrators-programme-2019-21-case-studies/developing-the-e-red-bag> (accessed 8 December 2022).
53. A short guide to digital and data in the NHS DIGITAL DOWNLOAD Key concepts. NHS Providers, 2023. Available at: www.nhsproviders.org (accessed 30 March 2023).
54. Burton JK, Wolters AT, Towers AM *et al.* Developing a minimum data set for older adult care homes in the UK: exploring the concept and defining early core principles. *Lancet Healthy Longev* 2022; 3: e186–93. [https://doi.org/10.1016/S2666-7568\(22\)00010-1](https://doi.org/10.1016/S2666-7568(22)00010-1).
55. The Topol Review: preparing the healthcare workforce to deliver the digital future. NHS Health Education England 2019. Available at: <https://topol.hee.nhs.uk/> (accessed 8 November 2022).
56. Digital Health Leadership in the NHS. Health Education England. Available at: <https://www.hee.nhs.uk/news-blogs-events/news/digital-health-leadership-nhs> (accessed 3 October 2022).
57. Ageing Data Research Collaborative @geridata. British Geriatrics Society. Available at: <https://www.bgs.org.uk/resources/ageing-data-research-collaborative-geridata> (accessed 8 November 2022).
58. Towers AM, Gordon A, Wolters AT *et al.* Piloting of a minimum data set for older people living in care homes in England: protocol for a longitudinal, mixed-methods study. *BMJ Open* 2023; 13: e071686. <https://doi.org/10.1136/BMJOPEN-2023-&#break071686>.
59. Burton JK, Goodman C, Guthrie B, Gordon AL, Hanratty B, Quinn TJ. Closing the UK care home data gap – methodological challenges and solutions. *Int J Popul Data Sci* 2020; 5: 1391. <https://doi.org/10.23889/IJPD.S.V5I4.1391>.

Received 23 December 2022; editorial decision 29 April 2023



ID NOW™ PLATFORM

KNOW FASTER SO YOU
CAN ACT QUICKER

NOW



Now, you can provide rapid molecular respiratory testing for COVID-19, influenza, RSV and strep A in any acute care setting, where and when it's needed most.



IDNOW.ABBOTT

NOW

IMPROVED WORKFLOW
with single patient swab for
COVID-19 and influenza A & B