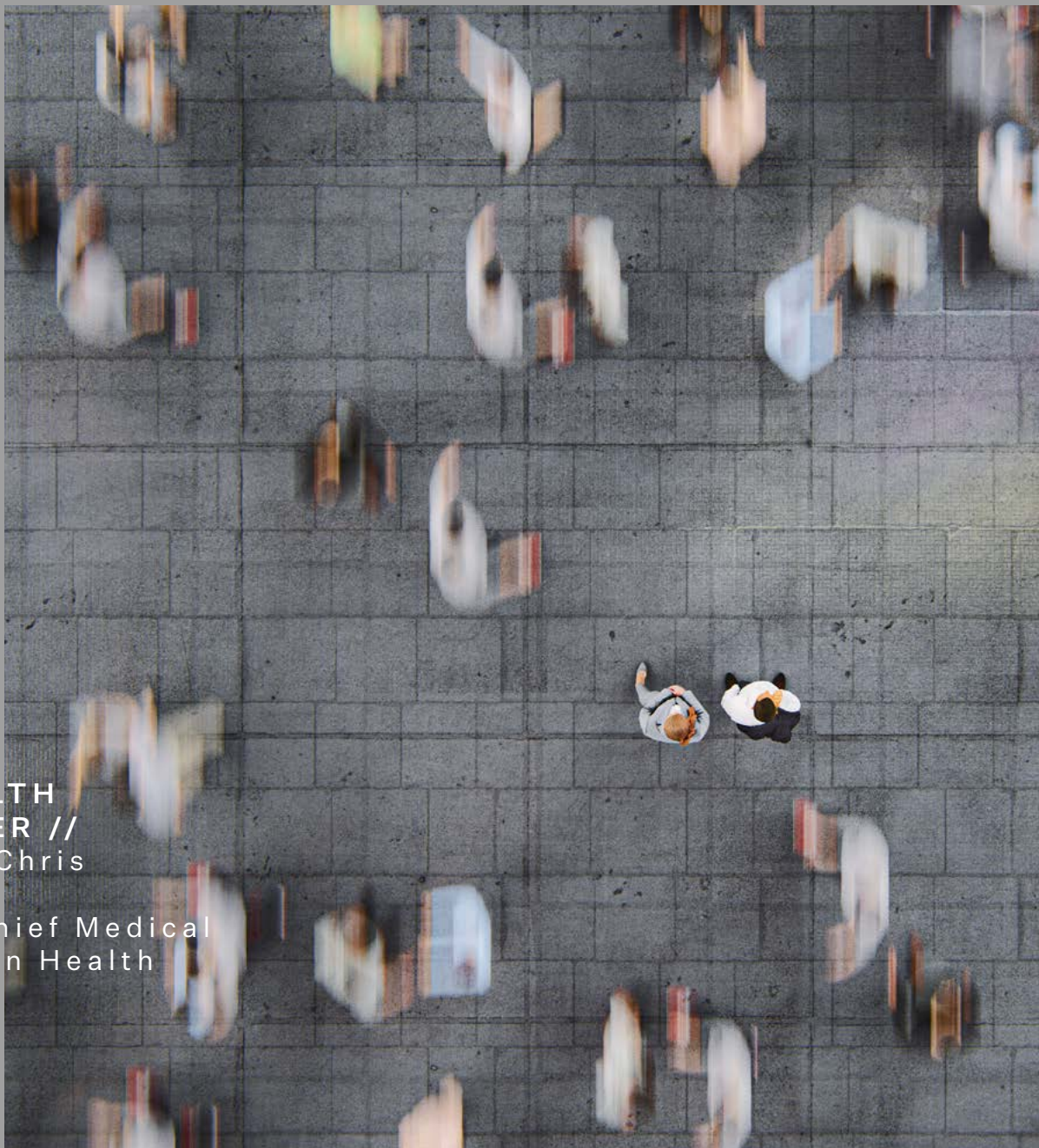

A path to advanced population health



ORION HEALTH
WHITE PAPER //
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Efficiently enabling clinicians to provide the right care, to the right patient, at the right time and in the right place

No one health system has everything right.

Imagine that we could improve the quality and efficiency of healthcare systems, deliver value for money, meet healthcare regulatory requirements, and allow patients to participate fully in the decision making about them, all while easing clinician workload? In the 21st Century it's easy to see there are enormous pressures on health systems and healthcare professionals everywhere to meet various competing demands.

Despite having access to a greater-than-ever volume of information, tests and treatments, clinicians are overloaded with demands. Demands for their time and expertise, and expectations that they can digest all information available to provide a swift, accurate diagnosis of even the most complex symptoms.

While most metrics of healthcare as a section of the economy have increased dramatically in the last three decades, the amount of time physicians spend on direct patient interaction has decreased.¹ Patients and providers are struggling to resist this trend and, in many cases, finding that computer-related stress is adding to clinician burnout, rather than relieving it.²

Patients may also believe that the health system doesn't meet their needs. For example, long wait times to see a primary care practitioner or specialist, variable results or exorbitant costs.³



¹ Irving, G., Neves, A. L., Dambha-Miller, H., Oishi, A., Tagashira, H., Verho, A., & Holden, J. (2017). International variations in primary care physician consultation time: a systematic review of 67 countries. *BMJ open*, 7(10), e017902. <https://doi.org/10.1136/bmjopen-2017-017902>

² Gregory, M. E., Russo, E., & Singh, H. (2017). Electronic Health Record Alert-Related Workload as a Predictor of Burnout in Primary Care Providers. *Applied clinical informatics*, 8(3), 686–697. <https://doi.org/10.4338/ACI-2017-01-RA-0003>

³ Xie, Z., & Or, C. (2017). Associations Between Waiting Times, Service Times, and Patient Satisfaction in an Endocrinology Outpatient Department: A Time Study and Questionnaire Survey. *Inquiry: a journal of medical care organization, provision and financing*, 54, 46958017739527. <https://doi.org/10.1177/0046958017739527>

What's wrong in healthcare today is that it's missing care.

ERIC TOPOL,
Deep Medicine



Utilising technology and data for better, more informed, empathetic care



What if we could utilise technology and data so effectively that we can release clinicians from the burden of time-consuming tasks? What if, rather than turning that extra time into an increase in productivity, we return it to doctors to spend with their patients? Time to listen, to empathise, to care.

We can use technology and data to highlight the risks that are the most critical or need the most attention. We can optimise clinical workflow based on a complete knowledge of all the patients in a population. We can ensure that everyone (that is, the whole population) receives the perfect care for them based on all the possible information that can be assembled.

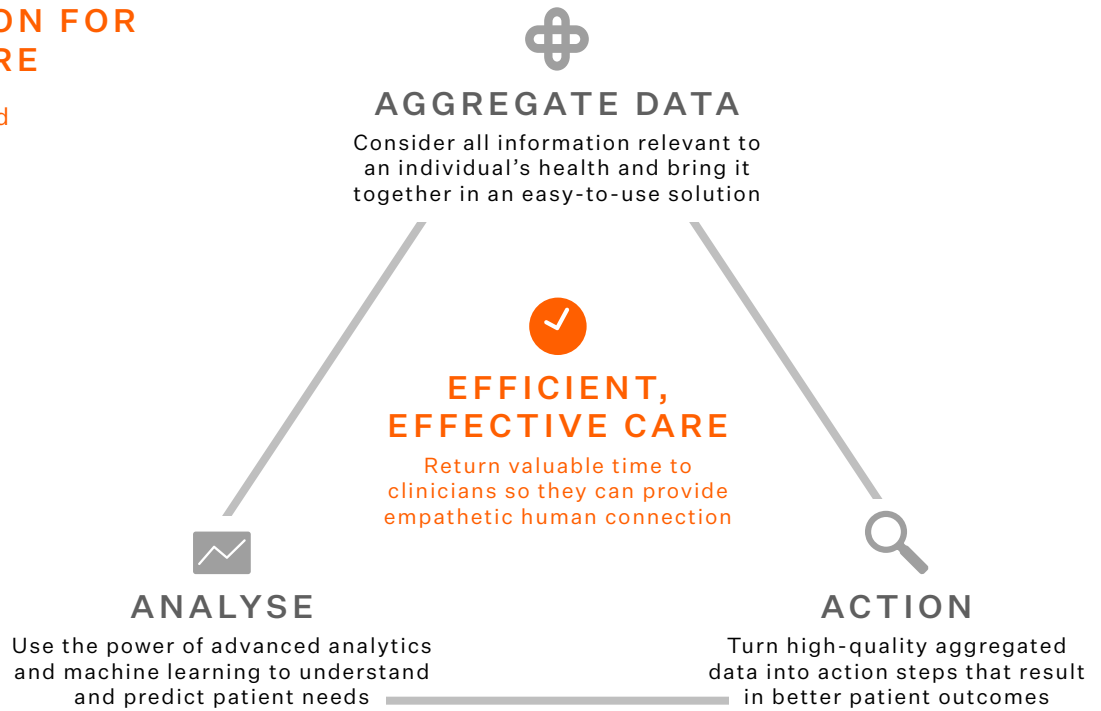
The population could be the whole population of a city, region or state, or a stratified population such as ‘women

of childbearing age’ or ‘children who haven’t been vaccinated’ or ‘patients with chronic co-morbidities’.

If we consider all the information relevant to every individual’s health – including their clinical, social, behavioural, environmental and genetic aspects – and bring this information together in an easy-to-use solution, we can likely achieve outcomes that were previously impossible. Additionally, leveraging aggregated data and using the power of advanced analytics and machine learning will allow us to predict patients who are likely to need additional help and coordinate their care in a more efficient, seamless way. If we can do all this then the clinician can focus on delivering the thing that is most important: better, more informed care.

INFORMATION FOR BETTER CARE

A path to advanced population health



With the complete picture of an individual's clinical history, combined with family history, social and environmental factors, clinicians have the right information needed in order to truly tailor treatment. Importantly, it is unrealistic to expect clinicians to consume and reason on a growing body of information without cognitive support. Simply having all the pertinent data in one place, with analytics, is powerful. But taking this further and applying artificial intelligence (AI) and machine learning techniques to whole populations, as well as research and reference material, will distil data into diagnostic and treatment recommendations that can be efficiently applied at the point of care.

This is not just an abstract ideal. While it's undeniably a journey and not a destination to better, more informed care, this paper aims to show how you can begin the journey – or extend the journey you are already on – in new and exciting directions. It explores how providers can put together a future-proof strategy to manage their whole population, improving the quality of care. This is a framework that can fit most population health needs, independent of where the provider sits on their journey, process, or path. You can revolutionise healthcare so that every patient receives the perfect care for them.

This is advanced population health.

Aggregating high-quality, meaningful data

In order to provide a complete longitudinal health record for an individual, it is critical to aggregate varied data sources. This opens the door for physicians to make diagnostic treatment decisions based on a deeper understanding of a patient's predisposition to illnesses and the likely efficacy of treatments.

For most healthcare organisations or networks, key data about their patient population lies in a range of internal and external systems. Before we can begin to make sense of this data or attempt to gain useful insights from it, it needs to be aggregated or brought together in one place. This is the first critical step toward delivering advanced population health.

However, data aggregation may be easier said than done. Electronic health records (EHRs) and other clinical systems have wide variation in the ways they encode, format, store and share data. That complexity is multiplied as they start to bring in data from an even greater variety of EHR and practice management systems, long-term care, rehabilitation, and home health systems that complete the continuum of care, and a range of new and emerging data types.

The challenge: new and emerging data types

Data types include clinical data (from EHRs, pharmacy, laboratory, imaging, and so on); medical device data, such as vital sign monitoring; patient generated data, including that from questionnaires, clinical status from remote patient monitoring systems, and goals; and health insurance claims data. Add to this the data that is produced by wearable technology and other consumer devices, such as step count, heart rate and sleep quality,

along with that available to individuals, such as genomic and microbiomic data through commercially available testing kits, and the volume of data available is huge.

Further, lifestyle, such as smoking status, alcohol and illicit drug use, diet and exercise, and social determinants of health, such as income, race, employment, housing and education information, are becoming an increasingly significant source of data that needs to be brought together with the existing data types. Environmental data, such as information pertaining to air quality or environmental pollution, can also be included in this ever-increasing 'tsunami' of information about individuals and their health.

The challenge: non standardised, 'messy' data across multiple disparate systems

There is also the challenge posed by abundant, existing, large data repositories that may still be operational. They often have valuable data which needs to be made available and liberated from legacy platforms. For example, in Canada, a large repository IT strategy was promoted for many years by Canada Health Infoway.⁴

Moving the data in these systems to a central repository would be an insurmountable task and one that makes little sense given that they are still operational with high transaction volumes. Moving the data to a separate repository would be a major undertaking technically and would necessitate someone paying twice for the cost of the data storage.

Normalising, indexing and presenting the data in repositories is a solution to this challenge. The benefit is easy incorporation of such data into a shared record or health information exchange (HIE). This is a complex, though perfectly possible task; it is one that must be engineered to deliver scrupulous quality of data for clinical purposes.

Clinical terminology services, translators, and natural language processing engines are essential to ensure an effective and accurate semantic layer that can normalise both free text and structured data of all types, as well as the many critical components of the record that are expressed differently across many different systems.

And what about sharing data between these disparate internal and external systems? For example, the HL7 format of a consolidated clinical document architecture (C-CDA) exchange is already well used. For many purposes, it is more than adequate. However, it doesn't contain the full context: for instance, clinicians usually prefer familiar clinical documents such as a discharge letter, a referral letter, or a consultation note in context in order to know and trust what they are looking at and to better understand a patient's situation.

This rich patient data is the backbone of advanced population health: an open health ecosystem that facilitates a complete patient record and allows clinicians to make more informed diagnoses. Recognising that, the US Federal Government passed the 21st Century Cures Act which strongly promotes the use of FHIR (Fast Health Interoperability Resources). This is an example of the trend in many jurisdictions globally to drive healthcare software evolution towards greater interoperability and use of FHIR APIs. These are key enablers

for advanced population health and improved individual patient care.

Aggregation is crucial to deliver the right care to the right patient, at the right time and location. It is the first – and arguably most important – step on the path to advanced population health.

The challenge of too much data

As we aggregate larger and larger volumes of different types of data, the 'potential' clinical value of the HIE increases. However, if clinicians can't easily sort, filter, search and ultimately find the most valuable data, then the 'actual' clinical value isn't realised.

Too much data is a problem across most clinical systems in use today – clinicians find they must wade through too much data, without tools to find the data they need. This is one (of several) reasons they are increasingly disappointed with the technology solution available to them. It reduces the time they can spend with their patients: listening, attending, planning and caring. It eats up the one resource that clinicians need more of – time. There are many good studies showing clinicians leaving the profession as a result.⁵

To address this overload, clinical actions must be efficient. Doing a good job in an integrated way, with complete patient information supported by an integrated medicines management platform, and software for compiling problem lists and electronic order entries, for example, is one way to ease overload efficiently.

⁴ <https://www.infoway-inforoute.ca/en/component-tags/tag/464-blueprint>² Gregory, M. E., Russo, E., & Singh, H. (2017). Electronic Health Record Alert-Related Workload as a Predictor of Burnout in Primary Care Providers. *Applied clinical informatics*, 8(3), 686–697. <https://doi.org/10.4338/ACI-2017-01-RA-0003>

⁵ Tajirian, T., Stergiopoulos, V., Strudwick, G., Sequeira, L., Sanches, M., Kemp, J., Ramamoorthi, K., Zhang, T., & Jankowicz, D. (2020). The Influence of Electronic Health Record Use on Physician Burnout: Cross-Sectional Survey. *Journal of medical Internet research*, 22(7), e19274. <https://doi.org/10.2196/19274>

Understanding data. Analytics, machine learning & artificial intelligence

Leveraging data-driven intelligence to improve care delivery is also something that a sound technology architecture can facilitate. With broad data aggregation comes the ability to learn from and act on relevant data in many powerful ways.

The technology architecture requirements for health data analytics include all the foundational data gathering, normalisation and repository creation components outlined so far. Additionally, solid business intelligence tools that not only allow analysts and non-technical users – such as healthcare professionals – to mine data for useful insights, but also automatically generate the core reports and dashboards that deliver data to the point of care, are key. For healthcare quality reporting purposes, healthcare systems need analytics and reporting tools that are automatically updated to meet the latest measures.

But to deliver advanced population health and care, analytics needs to be employed to explore data sets efficiently, discover meaningful insights and identify gaps in care at both a population and individual level.

Next generation tools enable population exploration in arbitrary detail according to a range of other factors such as race or ethnicity, and location. For example, if a healthcare provider is interested in investigating and improving the immunisation rate in their population, population exploration would involve understanding the overall immunisation rate, followed



by understanding what percentage of that rate (say) are children of minority groups; and then, further, what percentage of those children come from overcrowded, low-income families. Those high-need patients can then be targeted for special attention in a way that is culturally appropriate for them. Having immunised the child, care workers can explore other aspects to the child's situation. High-need families tend to have multiple issues impacting their clinical care including their social determinants of health status.

So far, the analysis is 'after the event'; that is, after the patient was or was not vaccinated. What if a provider could predict who will receive a vaccination and who won't in the next three months? What if this information was available before the event? For

example, if we could learn that a child who lives on a street in a particular suburb has only a small chance of receiving their regular vaccinations, then we could target that child with more resources to ensure they receive the vaccinations they need. To do this requires predictive modelling using artificial intelligence and machine learning algorithms applied to aggregated high-quality data in a population.

Knowing this information is the second step toward advanced population health, the next is the ability to act on that information. Using the example above, we can take children who haven't been vaccinated and those children with a high chance of missing vaccines, and seamlessly add them to a worklist for clinicians and care managers to focus on.

Enabling clinicians and patients to take the right actions

Making the right thing the easy thing to do.

Moving from viewing to doing

This is the all-important transition from ‘viewing’ to ‘doing’ – where the world of software and information directly impacts the clinician and the patient. The challenge is to turn this high-quality aggregated data into ‘actionable information’ so that clinicians – in full partnership with their patients – can do their jobs better, resulting in better patient outcomes. There are many ways of thinking about this challenge, including improving care coordination and avoiding wasteful care using high-quality clinical workflow tools and standardised clinical pathways.

The challenge of efficient care coordination

The term ‘coordinated care’ can be conceptualised in at least two distinct ways.

The first is the process by which patients are moved through the healthcare system in an efficient and coordinated way, by viewing the patient as a unit within a larger population cohort. This is the path from analytic measure, to shared worklist, to a care pathway; coordinating this ‘traffic flow’ of patients through the healthcare system adds a lot of value by using consistent processes across the population.

An example might be the checks that, for example, every patient in palliative care, or every woman should have at regular intervals, such as smear tests, contraceptive discussions, mammograms, and so on, as part of agreed uniform best practice. The software ensures every relevant impacted patient in that population goes through the necessary steps to ensure they receive the right care at the right time.

The second aspect of care coordination relates to managing the workload of individual providers. By coordinating care and increasing workflow efficiencies, software solutions reduce the risk of clinician burnout by making ‘the right thing the easy thing to do’ – that is, the right ‘action’ (the right care for the patient) should be easy and efficient for both clinician and patient to know what needs to be done.

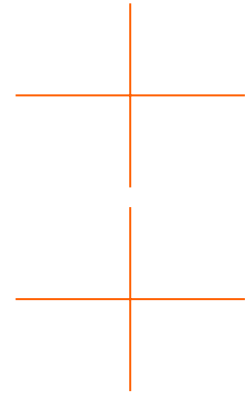
This aspect to care coordination respects each patient’s individual differences and coordinates care based on specific information and their unique care plan. Individual patient differences matter: it is this information that assists all providers in knowing how to care for that patient with the use of integrated tools, such as a medications management platform, or clinical referral software. These integrated tools help to include patients as active, engaged participants in their care and, in many situations, the patient’s caregivers too.

Both ways of understanding care coordination include the assessment and targeting of patients most likely to benefit from care. They also guide providers to better manage their patients by reducing overtreatment or low-value care, such as unnecessary medications, tests, treatments and procedures that provide little to no benefit or, indeed, potential harm.

Knowing is not
enough;
we must apply.
Willing is not enough;
we must do.

J W VON GOETHE





The challenge of provider, patient and caregiver burnout

Clinicians and caregivers want to do the right thing for their patients; they truly care and want to provide the right treatment while also being aware of the powerful benefits that come from empathetic human connection with their patients. Clinician, caregiver and patient burnout is a widely documented result of multiple factors pressuring clinicians to do more with less time for direct patient interaction. Electronic health record (EHR) usability issues are very high on the list of identified factors contributing to burnout, as is having to process too much information, much of it tending to be redundant boiler plate text that takes too much time and effort to analyse efficiently.⁶⁻⁷ Perceived poor efficiency is the factor most associated with physician dissatisfaction with EHRs when controlling for other factors.⁸ A particularly important issue is lack of support for integrated collaborative care provided by typically siloed EHR systems.⁹

All parties can become frustrated, especially when dealing with complex clinical scenarios. Clinicians need easy access to the right data to make decisions at both a clinical level and the level of the population they are responsible for. Patients and their caregivers also suffer frustration and burnout from the difficulty of navigating their way through a complex, fragmented healthcare system.

The technology solution needs to be well designed and implemented if it is to work in support of effective data-driven action. This means giving healthcare providers the right tools and actionable insights at the right place in their daily workflows, allowing them to do their jobs smoothly and with the added value derived from population and individual patient data analyses.

A crucial differentiator is being able to take the clinician seamlessly from a quality measure or other population-

level analysis such as a risk score, to a shared worklist for a team to manage, to a specific care pathway for each patient. The data is both individually identifiable and privacy controlled. When a cohort of patients is identified, such as '10% of the diabetics in this population', namely the following individuals, need an annual eye check in order to meet the following clinical quality measure(s), clinicians know the names and IDs of the 10% that need to be addressed based on an automatically generated, shared worklist.

This makes it possible to act by delivering the right care to the right patients at the right time and in the right place. By delivering the best quality care in the most efficient manner, the solution creates sufficient time for quality care as well as the time to give our patients the genuine empathy they need and deserve from their clinicians.

⁶ Tajirian, T., Stergiopoulos, V., Strudwick, G., Sequeira, L., Sanches, M., Kemp, J., Ramamoorthi, K., Zhang, T., & Jankowicz, D. (2020). The Influence of Electronic Health Record Use on Physician Burnout: Cross-Sectional Survey. *Journal of medical Internet research*, 22(7), e19274. <https://doi.org/10.2196/19274>

⁷ Kaipio J, Lääveri T, Hyppönen H, Vainiomäki S, Reponen J, Kushniruk A, Borycki E, Vänskä J. Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland. *Int J Med Inform*. 2017 Jan;97:266-281. doi: 10.1016/j.ijmedinf.2016.10.010. Epub 2016 Oct 17. PMID: 27919385.

⁸ Williams DC, Warren RW, Ebeling M, Andrews AL, Teufel II RJ. Physician Use of Electronic Health Records: Survey Study Assessing Factors Associated With Provider Reported Satisfaction and Perceived Patient Impact. *JMIR Med Inform*. 2019 Apr 4;7(2): e10949. doi: 10.2196/10949. PMID: 30946023; PMCID: PMC6470463.

⁹ Kaipio J, Lääveri T, Hyppönen H, Vainiomäki S, Reponen J, Kushniruk A, Borycki E, Vänskä J. Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland. *Int J Med Inform*. 2017 Jan; 97:266-281. doi: 10.1016/j.ijmedinf.2016.10.010. Epub 2016 Oct 17. PMID: 27919385.

How does advanced population health work in the real-world clinical context?

New patient, not seen before at this clinic or hospital.

A frequent challenge for clinicians is that of managing a new-to-the-clinic patient (for example, those who have just moved from another town, or across town) when there's no record in the local electronic medical record (EMR) or clinical information system (CIS). Visits to the emergency room also frequently fit into this group. The availability of a complete record in the HIE greatly simplifies and focuses the clinician's attention.

Coordination of patients with complex chronic conditions.

Patients with long-term chronic conditions such as diabetes and congestive heart failure (CHF) see many clinicians, specialists, and community care sites. The challenge is for all members of the patient's care team to know all about the patient's progress or clinical status, so they can all work together in alignment. A shared record such as an HIE is ideal, especially when the patient has been in the community and hospital(s).

Mental health patients.

As a group, mental health patients tend to suffer from fragmented care due to visiting many different care settings and emergency departments. Coordinating their care is difficult when they don't have a care coordinator or any stable long-term relationship with a clinician. Substance use disorder (SUD) patients, for example, will often go to great lengths to seek care at far away locations hoping their providers won't connect the dots. The HIE is an ideal tool for assessing and understanding mental health patients and then coordinating their care.

Advanced population health



Health systems everywhere face multiple challenges to their financial sustainability while needing to address multiple other competing demands. As well as financial sustainability, common challenges include managing the ongoing COVID-19 pandemic, demands by patients and regulators to further support patient empowerment, addressing systemic inequity and the social determinants of health, while also maintaining high clinical quality standards and meeting a raft of other regulatory mandates.

Into this situation, advanced population health can help. It involves assembling all the information about every patient in a population, understanding the data, then making targeted, effective interventions one patient at a time in order to improve the whole population's health. It is the logical starting point for value-based care initiatives which generally seek to improve overall quality of care and to reduce the cost of delivering that care. Knowing a patient population in detail is the first step to efficiently targeting patients in most need of clinician time, and to coordinating the care of a population.

While the core message of population health is straightforward to articulate, as always, 'the devil is in the details.' Advanced population health can only be achieved via a comprehensive approach to all available data, seeking to understand the current state of the population and to target patients who

are most likely to benefit from a range of possible interventions.

The data challenges often start with addressing data quality, and planning for incorporation of new data types also may be challenging. This white paper describes some important capabilities of the requisite technology and data management needed to achieve advanced population health.

In addition to being able to manage the large volumes of data involved in population health management, technology solutions need to address other current data challenges. One of the most prominent is the challenge of presenting the right data for clinicians to access where and when they need it. Typical EHR and HIE software solutions today present too much data to clinicians when reviewing a patient. Too many providers and patients are struggling with the current combination of non-interoperable technologies and too much redundant data that doesn't assist in understanding the patient's situation.

It is a significant yet achievable challenge to use appropriate technology for better, more informed and empathetic care delivery, and one that requires us to 'lift our game' on multiple fronts. However, enough of the enabling technology is well understood and already exists to convince us that delivering the right care to the right patient at the right time and place can be done today.

References

- Irving, G., Neves, A. L., Dambha-Miller, H., Oishi, A., Tagashira, H., Verho, A., & Holden, J. (2017). International variations in primary care physician consultation time: a systematic review of 67 countries. *BMJ open*, 7(10), e017902. <https://doi.org/10.1136/bmjopen-2017-017902>
- Gregory, M. E., Russo, E., & Singh, H. (2017). Electronic Health Record Alert-Related Workload as a Predictor of Burnout in Primary Care Providers. *Applied clinical informatics*, 8(3), 686–697. <https://doi.org/10.4338/ACI-2017-01-RA-0003>
- Xie, Z., & Or, C. (2017). Associations Between Waiting Times, Service Times, and Patient Satisfaction in an Endocrinology Outpatient Department: A Time Study and Questionnaire Survey. *Inquiry: a journal of medical care organization, provision and financing*, 54, 46958017739527. <https://doi.org/10.1177/0046958017739527> <https://www.infoway-inforoute.ca/en/component/tags/tag/464-blueprint>
- Tajirian, T., Stergiopoulos, V., Strudwick, G., Sequeira, L., Sanches, M., Kemp, J., Ramamoorthi, K., Zhang, T., & Jankowicz, D. (2020). The Influence of Electronic Health Record Use on Physician Burnout: Cross-Sectional Survey. *Journal of medical Internet research*, 22(7), e19274. <https://doi.org/10.2196/19274>
- Tajirian, T., Stergiopoulos, V., Strudwick, G., Sequeira, L., Sanches, M., Kemp, J., Ramamoorthi, K., Zhang, T., & Jankowicz, D. (2020). The Influence of Electronic Health Record Use on Physician Burnout: Cross-Sectional Survey. *Journal of medical Internet research*, 22(7), e19274. <https://doi.org/10.2196/19274>
- Kaipio J, Lääveri T, Hyppönen H, Vainiomäki S, Reponen J, Kushniruk A, Borycki E, Vänskä J. Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland. *Int J Med Inform*. 2017 Jan; 97:266-281. doi: 10.1016/j.ijmedinf.2016.10.010. Epub 2016 Oct 17. PMID: 27919385.
- Williams DC, Warren RW, Ebeling M, Andrews AL, Teufel li RJ. Physician Use of Electronic Health Records: Survey Study Assessing Factors Associated With Provider Reported Satisfaction and Perceived Patient Impact. *JMIR Med Inform*. 2019 Apr 4;7(2): e10949. doi: 10.2196/10949. PMID: 30946023; PMCID: PMC6470463.
- Kaipio J, Lääveri T, Hyppönen H, Vainiomäki S, Reponen J, Kushniruk A, Borycki E, Vänskä J. Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland. *Int J Med Inform*. 2017 Jan; 97:266-281. doi: 10.1016/j.ijmedinf.2016.10.010. Epub 2016 Oct 17. PMID: 27919385.

