



HealthPros

International Training Network for
Healthcare Performance Intelligence Professionals



POLICY SUMMARY REPORT ON THE VALUE OF RESULTS-BASED TOOLS IN HEALTHCARE MANAGEMENT

Lessons learned from COVID-19 dashboards

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PREFACE

HealthPros is a H2020 Marie Skłodowska-Curie Innovative Training Network for Healthcare Performance Intelligence Professionals under grant agreement No 765141, running from January 2018–April 2022. Healthcare performance intelligence can be defined as a structured approach to acting on health policies, using knowledge and information generated through scientific methods and health data to systematically measure indicators of health system performance. The network set out with the aim to train a first generation of Healthcare Performance Intelligence Professionals (HealthPros Fellows) that can make effective use of available healthcare performance data in countries to improve integrated services delivery, patient engagement, equality in access to healthcare, health outcomes and reduce waste in healthcare.

Since 2018, HealthPros Fellows have completed innovative research and multidisciplinary training in Canada, Denmark, Germany, Hungary, Italy, the Netherlands and the United Kingdom. As part of their training, Fellows also completed secondments at partner organizations as an opportunity to obtain local guidance and conduct applied research.

Throughout the programme, HealthPros Fellows have worked to develop tools and implement methods to streamline healthcare performance measurement, develop and apply performance-based governance mechanisms and optimize the use of healthcare performance intelligence by different end-users. Topics explored through a healthcare performance intelligence lens in their work include: actionability of performance indicators; composite measures; integrated care; corporate governance tools; patient and citizen engagement; nudging; use of routine databases for performance improvement; and, long-term care. As the COVID-19 pandemic paralleled the HealthPros programme, many Fellows and the network at-large, sought opportunities to conduct a number of COVID-19-related studies at pace with the pandemic's changing context.

Outputs of the HealthPros programme have continuously been published as open access studies in international, peer-reviewed journals. Additionally, Fellows have actively contributed to webinars, conferences, the delivery of courses, policy dialogues, direct country support, and media engagements, among other types of dissemination to continuously share new findings throughout the programme.

This **Healthcare Performance Intelligence Series** represents the culmination of key research findings by the network into a collection of reports providing methodological, practical, and policy guidance. Reports in the series are tailored to different audiences, ranging from policy-makers, hospital managers, clinicians, and the general public. The development of each report in the series has relied

on close collaboration across the HealthPros network. The range of topics and resources making up this series includes the following:

- Practical experience with implementing disparity and composite measures in large-scale routine quality improvement work to support transferability to other HC systems (No. 1.2 2022)
- A practical guide towards actionable healthcare performance indicators: Selecting healthcare performance indicators that are fit for purpose and use for various stakeholders (No. 1.3 2022)
- Policy guidance on advancing the performance assessment of integrated healthcare systems (No. 1.4 2022)
- Policy guidance on the use of PREMs to improve health system performance (No. 2.2 2022)
- Policy summary report on the value of results-based tools in health care management-Lessons learned from COVID-19 dashboards (current)
- Business model for effectively involving patients in the financial decision-making of health insurance funds- A guide to health care insurers on fostering the engagement of citizens based on recent experiences in the Netherlands. (No. 2.4 2022)
- Policy summary report on best practices for linking financial incentives to health care performance at individual health care provider, institutional and regional level- A business case for value-based health care systems based on performance intelligence (No. 2.5 2022)
- Policy recommendations on the role of nudging for health care performance assessment agencies (No. 3.2 2022)

The full series of reports can be found online (<https://www.healthpros-h2020.eu/>). For questions related to the series or HealthPros network please contact Dionne Kringos, PhD (d.s.kringos@amsterdamumc.nl).

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1. Results-based tool in healthcare management

1.1. The role of results-based tools in healthcare

When using results-based tools in corporate setting, the bottom line is most often focused on revenue or profit. In healthcare, it is focused on looking at outcomes and experiences that increase value for patients, staff, carers and the wider society. HealthPros conducted research to better understand how to use these corporate tools in healthcare setting.

Results-based management tools, such as for example balanced score cards, control charts and dashboards, are commonly used in the corporate sector to improve results by monitoring performance, learning, adapting and target setting. When used in the corporate setting, the bottom line is most often focused on company's revenue or profit. Such tools may be useful in healthcare management as well. However, they cannot simply be "transferred" to healthcare setting. Since healthcare differs essentially from goods produced in the corporate sector, due to the existence of dynamic policy environments and strong stakeholder influence, existing tools from the corporate sector cannot simply be transferred to the healthcare area but need to be tailored to the specific needs of the healthcare environment and its services.

1.2. Dashboards as results-based tools in healthcare management

Dashboards are an established managerial tool in the corporate sector but relatively novel in healthcare. Prior use of dashboards during infectious disease outbreaks was very limited.

Dashboards are a dynamic modality for reporting data visually, typically designed as a single screen with the aim to quickly and effectively present users with critical information to act upon. Unlike static reporting modalities, such as reports, reviews or plans, dashboards have the potential to present (near to) real-time data updates, at-a-glance. These are often referred to as performance, business intelligence or data dashboards and have been adopted and used widely by businesses for years, providing a quick overview of a company's performance. The use of dashboards in the health sector, mostly lagging behind their use in the corporate sector, has traditionally been reserved for internal purposes, assisting managers in strategic and operational decision-making, particularly in hospitals, and supporting clinicians in clinical care and quality improvement. Up until recently, other uses of dashboards included health system performance assessments, policy evaluation and public reporting. The use of dashboards in earlier infectious disease outbreak responses, especially for public reporting, has been very scarce.

1.3. The ubiquitous use of dashboards during the COVID-19 pandemic

The use of dashboards exploded worldwide during the COVID-19 pandemic. Since early 2020, HealthPros research looked at what makes COVID-19 dashboards actionable, how they change with time, what can be learned from teams developing them and what are their potential uses going forward. Our results show that a lot has been done, areas for improvement are ample and that dashboards are likely to stay, for COVID-19 and other uses in healthcare.

Dashboards have become the reporting modality of choice for COVID-19 data since early 2020. As a result, public, web-based dashboards have been widely developed by national, regional and local governments but also by international organizations, academia, and industry, as well as by independent initiatives. This ubiquitous use of dashboards as a public reporting tool during a pandemic is novel. Through a series of research studies, conducted and coordinated by HealthPros Fellows and Principal Investigators since the early days of the COVID-19 pandemic, we specifically looked at what makes COVID-19 dashboards actionable, how (much) do they change over time, what can be learned from the process of developing dashboards, and what are the possible future scenarios for their use.

In a global study of 158 COVID-19 dashboards from 53 different countries, in the early stages of the pandemic, we identified seven features common to highly actionable dashboards. [1] We also specifically looked at dashboards in Canada and in the Netherlands throughout 2020 and assessed how they developed and if the presence of actionability features changed over time. [2,3] Furthermore, we interviewed COVID-19 dashboard teams in 33 countries of the WHO European Region and learned about the development process but also about common barriers, enablers and lessons from the experiences of teams responsible for their development. In the same study, we identified four possible scenarios for the future use of COVID-19 dashboards, but also data dashboards in healthcare in general. [4]

2. Lessons learned from COVID-19 dashboards

2.1. The seven features of highly actionable dashboards

The effective use of dashboards, through the translation of data to information, information to knowledge, and knowledge to decision-making, is determined by their actionability. Our 2020 HealthPros-wide research effort looked at 158 COVID-19 dashboards from 53 countries around the world and identified seven features common to highly actionable dashboards.

While COVID-19 dashboards may be widely accessible, their effective use is determined by their actionability. Actionable information is paramount in the context of the COVID-19 pandemic. When information is actionable, it has greater potential to inform decision making and behaviour changes that can benefit both individuals and society at-large. To be actionable, the information should be both fit for purpose – meeting a specific information need – and fit for use – getting the right information, into the right hands at the right time and in a manner that is understood. In other words, the mere accessibility of COVID-19 dashboards does not guarantee data-informed decision-making.

Their differences aside, the dashboards analysed in our study ultimately shared a common aim: to serve as both a communication tool and call for individual and collective action to respond to the COVID-19 pandemic. Despite their contextual differences (or exactly because of these), our results indicate that some dashboards fulfil their function of communicating, informing decision-making and supporting behaviour change better than others. And, while it is also clear there is no single approach to developing a dashboard, our results suggest that introducing certain features may enhance a dashboard's actionability.

Communication sciences, health promotion and the emerging field of healthcare performance intelligence offer insights into the effective delivery of information, and our research work identified these seven features, common to highly actionable dashboards:

1 Know the audience and their information needs	Dashboards with a known audience and explicit aim had focus and continuity in their content, analysis and delivery.
2 Manage the type, volume and flow of information	The selection of a concise number of indicators brought focus and importance to the information and the possibility to view indicators together, at-a-glance.
3 Make data sources and methods clear	A clear source of data and explanation of an indicator's construction, including limitations, were an important component of trust achieved and clarity gained.
4 Link time trends to policy (decisions)	Reporting data over time together with the introduction of key decisions facilitated an understanding of their effect (or lack of) and raised compliance.
5 Provide data 'close to home'	Granular geographic breakdowns are needed. Data that is highly aggregated was difficult to understand. Maps (over tables and charts) were most effective.
6 Breakdown the population to relevant sub-groups	Providing data with the possibility to explore varied population characteristics made indicators relatable to individual users. It allows an understanding of risks and trends based on one's own demographics. It also can facilitate equity-driven decision-making by exposing differences among the population.
7 Use story-telling and visual cues	Bare statistics without a narrated analysis leave the burden of interpretation solely to the user. Brief explanations on the meaning of trends used in combination with visual techniques, such as intuitive color schemes and icons, supported ease of interpretation.



Features of actionable dashboards

2.2. Evolution of COVID-19 dashboards

Alongside being a dynamic modality for reporting data visually, COVID-19 dashboards are dynamic themselves, evolving and changing with the pandemic. In two country-focused studies, in Canada and in the Netherlands, we assessed changes to a number of COVID-19 dashboards during 2020 and identified patterns and areas for improvement.

Recognizing the speed with which COVID-19 dashboards were launched in 2020, traditional technical and organizational aspects of development cycles were shortcut. While the urgency of reporting took precedent in the early stages, dashboards by design are flexible and meant to be continuously iterated. Previous research work emphasised the importance of frequent reviews to ensure dashboards' sustained relevance and use. As our global study of COVID-19 dashboards was a snapshot of the early stages of the pandemic, the extent to which COVID-19 dashboards changed over time was explored in two separate country-focused studies in Canada and the Netherlands.

In Canada, where we looked at 26 different dashboards at two points in time during 2020, improvements made to the dashboards over time were identified, predominately related to data (specificity of geographic breakdowns, range of reported indicators, explanations of data sources and calculations) and advancements enabled by the dashboard technology used (customization of time trends, interactive and visual chart elements). Similarly, improvements to the presence of actionability features, described earlier, were most pronounced for providing data locally, reporting time trends, and managing the type, volume and flow of information. No improvements on communicative elements of the dashboards (clarity of purpose and audience) were found. The use of story-telling techniques, to narrate data and its trends, also remained largely absent from Canadian dashboards.

In the Netherlands, the national COVID-19 dashboard, developed by the government, was gradually adapted from its purpose to internally inform policy makers towards informing the general public. Here political choices, like the choice to have all the data sources open access and on what geographical level to present the data to feel the urgency, became more important as it developed towards the wider audience. The development team involved citizens and experts in communication and data visualisation and added story-telling techniques to narrate trends to optimize the dashboard for better understanding. However, as the pandemic persisted, it missed out on the opportunity to grow its relevance by adding COVID-19 context of social, economic, and non-COVID-19 care burden.

2.3. Insights from dashboard developers

To provide support during the current pandemic and to better prepare for future health threats, as well as other potential uses of COVID-19 dashboards, in 2021, we partnered with the WHO Regional Office for Europe. Aim of this work was to explore how can the development process of COVID-19 dashboards during the first year of the pandemic be described from the perspective of European and Central Asian teams responsible for national dashboard development and what common barriers, enablers and lessons can be derived from their experiences. These experiences signalled initial under-preparedness, compensated by high-level political endorsement, teams' own professionalism and commitment, accelerated data improvements and commercial dashboard software solutions.

Describing the processes of developing COVID-19 dashboards has to-date predominately focused on individual country accounts, typically reported by the media. Scientifically studying the development process felt critical to ensure that first-hand experiences of developing COVID-19 dashboard will not be lost but also to support immediate networking among dashboard teams. In the European region, several actors, such as the World Health Organization, European Centre for Disease Control, and Eurostat, have led initiatives for multi-country COVID-19 surveillance, setting new methodological standards for data collection and comparative reporting. To support governments during the current pandemic and to better prepare for future health threats as well as other potential uses of dashboards, our research group set out to conduct a multi-country study on the process of developing COVID-19 dashboards across Europe and central Asia. To do so, we partnered with the WHO Regional Office for Europe, as a key convening actor in the region and counterpart of our target healthcare system stewards.

During the first half of 2021, we interviewed 80 informants, representing 33 national COVID-19 dashboard teams across the Region. Most national COVID-19 dashboards were launched swiftly in the first months of the pandemic, between February and May 2020. The urgency, intense workload, limited human resources, data and privacy constraints, and public scrutiny were themes common to the initial development stage. Recurrent barriers and enablers related to the pre-pandemic and pandemic context, people and processes, software, data, and users should inform investments at all levels—dashboard teams, national and pan-European—level. Lessons around the themes of simplicity, trust, partnership, software and data, and change indicate areas for taking action to fully realize a data-informed approach to stewardship using dashboards.

Insights from the development process revealed more similarities than differences across countries

Responsible organizations, teams and launch	"We were flying the plane as we were building it."
Aims, users and content	"Knowing that there is no perfect indicator, we try to show various indicators so that they mirror the reality in our country."
Data sources and breakdowns	Choose open access data as much as possible. This was an important political discussion.
Displaying, interpreting and visualizing data	We learned it is super extra important to describe all the measures as soon as possible, because otherwise questions arise, and the information will be misinterpreted.

Five lessons learned themes emerged during these conversations

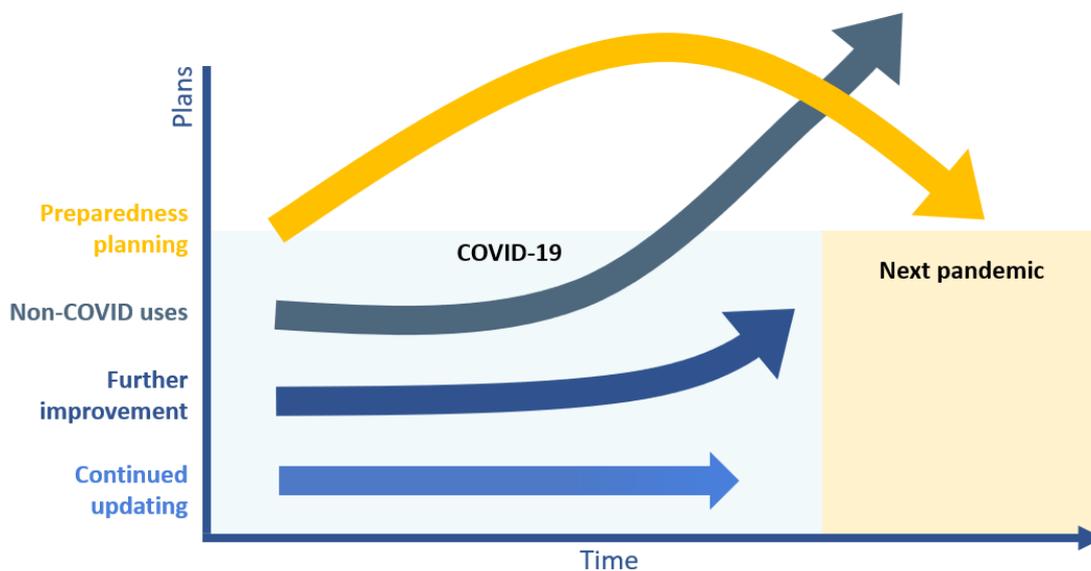
Simplicity	"It is super extra important to describe all the measures as soon as possible...the first-time people see a number, [that is] the way they understand it and they will continue misinterpreting it forever."
Trust	"Be brave enough to try it out, to put stuff out and also be transparent while doing it. And, if you have mistakes, also be transparent about it."
Partnership	"We also considered the needs of politicians: what do they need to make their decision? So, there is the public health side and the political side that have to be taken into account."
Software and data	"The tooling influences a lot how the dashboard looks in the end and what is feasible."
Change	"We never saw the website as a separate entity but as a central place from which we disseminate info to other communication platforms."

2.4. Future of COVID-19 dashboards

The portfolio of our dashboard-related research also looked at the future use of dashboards in healthcare, during and beyond the COVID-19 pandemic. Our results indicate dashboards really are here to stay. European region's dashboard teams indicated four, non-mutually exclusive, possible scenarios of bringing the acquired expertise and experience further.

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Discussing what is next for COVID-19 dashboards, four non-mutually exclusive scenarios were identified: (1) continuing to update existing dashboards, though less frequently with time; (2) further developing content (e.g., vaccines, wastewater studies), data management (e.g., automatization, quality, open data), design (e.g., visuals, organization) and user elements (e.g., low literacy levels, user behaviour studies); (3) exploring non-COVID uses of dashboards for monitoring other communicable diseases (e.g., influenza) and registry data (e.g., cancers); and (4) preparedness planning, including investing in centralized data warehouses, in-house dashboard teams, coordinating across European countries and exploring alternative server and software options.



3. Summary and policy implications

3.1. Results-based tools in healthcare: Lessons from COVID-19 and implications going forward

COVID-19 highlighted dashboards are an important managerial tool and a communication device in healthcare, from which many practical lessons can be drawn going forward. Systematic approaches to exploring user needs and use patterns are necessary, helping dashboards bridge the gap between their role as an “internal” managerial tool and an “external” accountability and public reporting device. Continued and expanded use of dashboards will require a more intentional approach towards their design and execution.

While COVID-19 highlighted dashboards as an important managerial tool and a communication device in healthcare, it also showed that they are not a silver bullet. Our research identified specific features of dashboards, which must fit with their intended purposes, in order to be actionable. Usefulness of data for their end users relies on the extent to which the information is communicated clearly and understood. However, we observed marked differences in the extent to which dashboards’ purposes are explored, discussed and defined. Approaches varied from dashboards solely presenting data (raw numbers) for the public to interpret themselves to others that endeavoured to provide explanations using narratives or visual methods. As previously known, the way in which information is presented may change not only the subjective comprehension but also the objective understanding of the information. Systematic approaches to exploring user needs and use patterns are crucial, helping dashboards bridge the gap between their use as an “internal” managerial, policy-making tool and a public reporting device, aiding accountability and individual decision-making.

The actionability of information is rooted in its fitness for purpose and use. Information presented through dashboards must be fit for purpose in that it resolves a specific information need. In the absence of this understanding, metrics are developed merely on their potential to be useful. Additionally, information must be fit for use in that it is the right information in the right hands at the right time and in an understandable form. While visualizations and added context can contribute to actionable metrics, other considerations, such as the availability and quality of the data and the delivery of information to users (i.e., how users gain access to it) also weigh on their use. As a reporting tool, the actionability of data for end users relies on the extent to which the information is communicated clearly and understood.

Our research identified dashboards and other interactive, visual, near–real-time data results-based tools, as the likely future of internal and public reporting in healthcare. COVID-19 dashboards served as a proof-of-concept, including how much can be achieved with limited resources and high urgency. They have also served to flag imminent areas for improvement and new challenges like potentially harmful misinformation. Sustainable use of dashboards in the longer-term and the expansion of their use for resilience and recovery plans and non-COVID monitoring, like on cancer, seasonal flu and patient safety, will have implementation and management implications and requirements. These were managed (or evaded) during the pandemic through mobilisation of emergency resources and individual motivation. The continued and expanded use of dashboards and other results-based tools, will require more intentional approach towards their design, implementation and use.



References

1. Features Constituting Actionable COVID-19 Dashboards: Descriptive Assessment and Expert Appraisal of 158 Public Web-Based COVID-19 Dashboards ([Journal of Medical Internet Research](#))
2. Exploring Changes to the Actionability of COVID-19 Dashboards Over the Course of 2020 in the Canadian Context: Descriptive Assessment and Expert Appraisal Study ([Journal of Medical Internet Research](#))
3. Development and Actionability of the Dutch COVID-19 Dashboard: Descriptive Assessment and Expert Appraisal Study ([JMIR Public Health and Surveillance](#))
4. The experiences of 33 national COVID-19 dashboard teams during the first year of the pandemic in the WHO European Region: a qualitative study ([medRxiv preprint](#))

Suggested reads

1. Comment on Verhulsdonck and Shah's "Lean Data Visualization: Considering Actionable Metrics for Technical Communication" ([Journal of Business and Technical Communication](#))
2. The Rise of the Pandemic Dashboard ([Bloomberg CityLab](#))