

The Way Forward: Optimizing a Patient Summary Solution with FHIR-Based Implementation

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Table of Contents

1. Summary	3
2. Introduction	4
3. FHIR IPS Can Be the Baseline for PS.	5
4. PS Implementation Considerations	5
4.1. Clinician Consensus and Adoption	5
4.2. Data Sources and Quality	5
4.3. Consistency of Clinical Terminology	6
5. PS Design and Implementation Patterns	6
5.1. The 'Practice-Based, EMR-Generated PS Document'	6
5.2. The 'Centralized Repository, Federated PS'	7
5.3. The 'Multi-Repository Query' Model	8
6. The Solution: A Dynamic, Flexible PS Approach with Smile CDR.	8
6.1. Benefit 1: Easier & Faster Access to Data	9
6.2. Benefit 2: More Relevant PS Views, Improving Clinician Decision Support	10
6.3. Benefit 3: Ability to Enhance Clinician Efficiency with SMART on FHIR	10
7. The Current State of Implementation and the Path Forward	11

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How implementing a flexible patient summary solution with FHIR enables better data interoperability, enhanced clinical decision making and improved patient outcomes

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Summary

By creating a “minimal and non-exhaustive, specialty-agnostic and condition-independent, but still clinically relevant” summary of a patient’s medical history, the HL7 International Fast Healthcare Interoperability Resources (FHIR) International Patient Summary (IPS) was originally intended to support unplanned cross-border care. However, the benefits of having easy access to a patient’s relevant medical data at every step of their healthcare journey extends beyond unplanned care. Patient summaries (PS) can enable more effective transitions of care and enhance continuity of care within and between health systems.

This whitepaper discusses the broader application of PS in planned medical care, focusing on a flexible PS approach using a FHIR-based data platform that assists with accessing and consuming patient summaries. Such a solution can resolve the issue of converting data formats from different sources, increasing clinical efficiency and reducing the amount of time spent accessing and clarifying medical information. The result would be improved patient outcomes, decreased readmission risk and lower healthcare costs.

Introduction

An efficient and effective healthcare system depends on clinicians having easy access to a patient's relevant medical data at every step of their healthcare journey.

A patient summary can be thought of as the minimum, necessary and sufficient demographic and clinical information required to facilitate interactions between patients and members of their care team. By serving up the most important health information about a patient as a standardized set of basic clinical data, providers get the essential information needed to promote informed care for scheduled and unscheduled encounters.

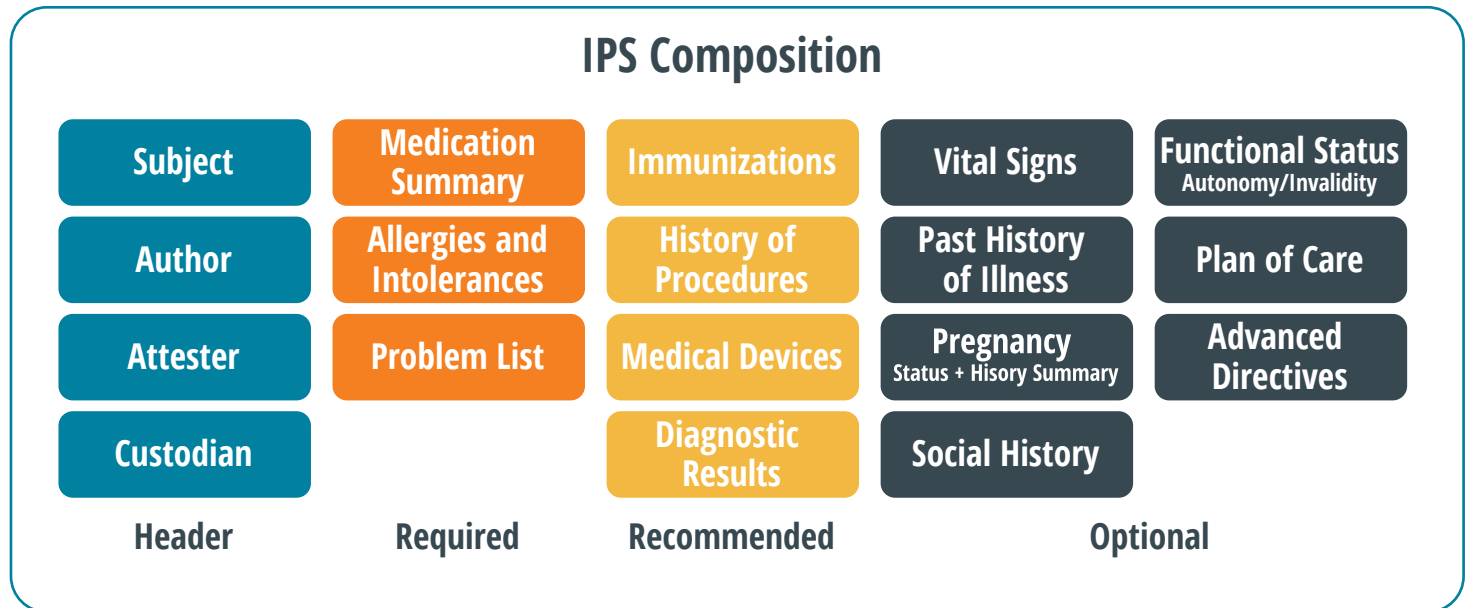
The HL7 International Fast Health Interoperability Resources (FHIR) International Patient Summary (IPS) is a standard that describes the data required to create a "minimal and non-exhaustive, specialty-agnostic and condition-independent, but still clinically relevant" summary of a patient's medical history. As the name suggests, the IPS was originally designed to support unplanned care across national borders.

While a patient's medical data within an IPS aids providers in delivering unscheduled, cross-border care, a patient summary (PS) can also be used to provide planned medical care. Patient summaries can enable more effective transitions in care and enhance continuity of care within and between health systems. A PS provides a baseline of medical data—including information on medications, previous surgeries, allergies, immunizations and more—that is valuable for scheduled healthcare across various care settings. Patient summaries fundamentally enable effective care coordination and, in the hands of patients, can improve health literacy.

Patient summaries can also be used to provide planned medical care. They can enable more effective transitions in care and enhance continuity of care within and between health systems.

With more accurate, integrated data, gaps in care are reduced, unnecessary tests and procedures can be eliminated and health outcomes can be improved. As such, a PS helps healthcare systems run more efficiently, with better allocation of resources and decreased costs.

Figure 1. IPS Composition Chart



Source: <http://hl7.org/fhir/uv/ips/>

FHIR IPS Can Be the Baseline for PS

The FHIR IPS describes patient summaries as electronic documents that are comprised of sections such as Medication Summary, Problem List and History of Procedures. As depicted above in Figure 1, some sections are mandatory, while others are recommended or optional for implementers to support.

PS Implementation Considerations

Key considerations for the design, implementation and adoption of Patient Summaries may include:

Clinician Consensus and Adoption

Even with the benefits of the FHIR IPS specification, implementation of patient summary standards within a jurisdiction requires consensus across stakeholders. Clinician requirements will need to be assessed against the IPS standard developed

by the international community. An incremental implementation path for a specific 'jurisdictional' PS may occur over a period of time before reaching full alignment to the IPS standard.

Health systems, in collaboration with the vendor community, may need to prioritize which elements of the IPS composition are higher priority for early implementation than others. Clinical workflow and processes that support the patient summary will need to be assessed and important concepts like "curation" of summaries addressed in implementation guidance.

Data Sources and Quality

Once stakeholders agree on the sections that will be included in a particular PS solution, the next step is to identify sources of clinical data that will be used to populate various sections of the summary. Often, a patient's most current health information resides in their primary care provider's (PCP) electronic medical record (EMR) system. This information is often recorded as a mix of free text and structured data. This clinical information may

be stored in a proprietary solution, which means that the data must be extracted and transformed so it can be shared with other systems.

Consistency of Clinical Terminology

Even in jurisdictions where HL7 data interoperability standards have reasonable levels of adoption, complexity exists when it comes to the use of clinical coding and terminology. Clinical code and value sets vary widely across systems, and health systems striving to implement the IPS may need to consider how existing terminology standards align with the IPS. A jurisdictional PS specification will need to reflect code and value sets that can be immediately implemented, with a plan to reduce complexity and variability in terminology over time.

PS Design and Implementation Patterns

While the IPS provides a standard for the content and structure of an electronic patient summary, it doesn't define the systems architecture for the exchange of patient summaries. We have observed three dominant implementation patterns that have emerged based on the current technology landscape:

The 'Practice-Based, EMR-Generated PS Document'

In this paradigm, a provider in a particular setting (primary care, speciality care etc.) curates and produces a patient summary for communication to, and receipt by, another provider and/or patient's system. This could be an EMR to EMR exchange of a patient summary, an EMR to personal health record (PHR) exchange, or an EMR to a jurisdiction's electronic health record (EHR). The patient summary is treated as an electronic document, received, managed and maintained as a static, point in time object.

While the IPS provides a standard for the content and structure of an electronic patient summary, it doesn't define the systems architecture for the exchange of patient summaries.

In this pattern, a patient could visit a PCP one day and a specialist the next, and each Provider would produce a PS from the patient data available in their EMR. Each PS document may contain only partial patient data, constrained by the sending Provider's context and the data available in their EMR. Where these PS documents are sent to a central EHR repository, a clinician seeking a PS would be presented with both summaries, one from the PCP and one from the specialist. Patients with multiple providers will have multiple patient summaries in the central repository, which can lead to several challenges:

- **Patient Safety Risk** - incomplete and/or conflicting patient summary documents can increase patient safety risk. With the storing and maintenance of multiple PS documents, Providers may feel the need to sift through multiple documents to determine a patient's conditions, medications and allergies. If discrepancies are noted between PS documents, and between summaries and EHR data, Providers are at increased risk of acting on incomplete or outdated patient information.
- **Risk of Clinician Cognitive Load** - intrinsic cognitive load refers to the amount of cognitive effort a clinician needs to expend to complete a clinical task or solve a problem. Any process that involves having to compare data and documents to compile a complete mental picture of a patient puts an unnecessary load on a Provider's short-term memory. This can negatively impact a Providers' goal of delivering safe, timely and quality care.

- **Risk of Incomplete Data and Context** -

Providers can have different perspectives on what is clinically relevant to a patient's care and how much data should be presented in a patient summary. As noted, the IPS standard is intended to be specialty agnostic and therefore relatively broad in the provision of information about a patient. This also means that PS data will provide an overview of the patient's health status and will not focus solely on, for example, a patient's chronic condition to the exclusion of other data. Clinical data curation has been a hallmark of clinical practice, but as medicine has become more specialized, curation has become complex and may be limited by the perspective and information system of the provider sending the PS document.

- **Information and Data Governance** - medical records technology solutions continue to evolve, but all are focused on the basic principles of managing the medical-legal record. However, with the advent of advanced clinical data repository technology, applied analytics and data-interoperability specifications, a composite and more complete view of a patient's data can be rendered from multiple source systems for the benefit of patients and their care teams. This consolidated view of patient data may be more complete than a PS document rendered by a single provider from a single source system. Information governance is a key consideration as sources of consolidated clinical data, and summaries generated from such real-time or near real-time data can improve timely care and clinical outcomes.

The 'Centralized Repository, Federated PS'

This PS implementation pattern is characterized by the sending of interoperable patient summaries to a centralized repository that consolidates and 'masters' the most up-to-date PS. This type of

centralized repository within a health system can be centrally accessed by a Provider in need of a PS, who can then curate and tailor the PS to meet their clinical needs. The centralized repository model that can generate a 'federated' patient summary still has several of the risks noted for single-source, curated PS documents; however, some advantages exist:

- **Distribution of Technology Costs** - every provider that needs to contribute a patient summary to the central repository needs to have adopted the required interoperability standards and will be bound by conformity. This level of orchestrated collaboration may result in a more equitable distribution of technology and change management costs across participating provider organizations.
- **Comprehensive Source Data Set** - with this pattern, patient-centric clinical data is contributed by multiple organizations from across the continuum of care and stored in a central 'jurisdictional' repository. This pattern creates a more comprehensive view of a patient's history and health status, from which to curate and produce patient summaries. Master data management capabilities can be applied to the data repository to increase data quality, thereby reducing the risks to patient safety and clinician cognitive load.
- **Greater Flexibility in PS Content Curation** - in the 'practice-based, EMR-generated PS document' model, it's the 'sending' Provider who curates the content of the PS for use by another Provider or by the patient. In the 'centralized, federated PS' model there is an opportunity for the 'receiving' physician to select the most relevant data for a planned/unplanned clinical encounter from available PS patient data. This model can also enable patient summaries to be used as the foundation for other clinical documents, such as e-referrals and discharge summaries.

- **Provider-Controlled Records Management** - a Provider that is in need of a patient summary to provide quality care can make the decision to save and store a patient summary in their EMR system. This puts the use of PS data in the context of clinical workflow, and better supports Providers in meeting regulatory obligations with respect to medical records management.

The 'Multi-Repository Query' Model

This implementation pattern recognizes that no provider will have all of a patient's current health data and that not all health systems will choose to have a centralized clinical data store. This model supports the generation of a PS by querying source clinical information/electronic medical records systems and using a 'get' call to consolidate and present PS data. Similar to the "centralized repository, federated PS" model, a clinician in need of a PS accesses a portal or interface to find and 'get' a patient's summary data against the standard from connected repositories. Ideally, each repository would be considered a 'source of truth' for a specific set of clinical data that is used to populate the PS. The most complex component of this model is the need for dynamic master data management, with complex rules to determine the most current and accurate patient data.

This implementation pattern has similar advantages to the previous model. Additional benefits could include the following, though these may be outweighed by the cost and complexity of solution administration:

- **Enhanced Timeliness of Patient-Centric Clinical Data** - since PS data is maintained at source and simply consolidated/constructed on a 'get PS' request, as soon as data is available in source systems, it can be made available to compose a patient summary. This model required enhanced adoption of data interoperability standards and leading API technologies

The Solution: A Dynamic, Flexible PS Approach with Smile CDR

Addressing the challenges outlined above requires implementation of a flexible PS solution that provides on-demand search capability, allowing clinicians to formulate their own patient summaries based on their clinical practice and the specific data needed to provide the highest level of care. A PS solution is defined here as a system that receives patient data—regardless of syntax and structure—and can serve up this data as a FHIR IPS bundle.

With a flexible PS solution, the core fields would be those that have been designated as required fields by the international standards community. However, different clinicians could then tailor their patient summary view based on their practice and the information that's relevant to them. For instance, the most critical information for an Emergency Department physician or team would be a patient's medication list and allergy history (along with other relevant data), which could have a real impact on saving a patient's life.

A flexible PS solution would allow for the easy extraction and interpretation of data residing in different source systems, even if that data is stored in varying formats. Keeping in mind the challenges and limitations of current IPS design paradigms, it's clear a new variable needs to be introduced into the equation.

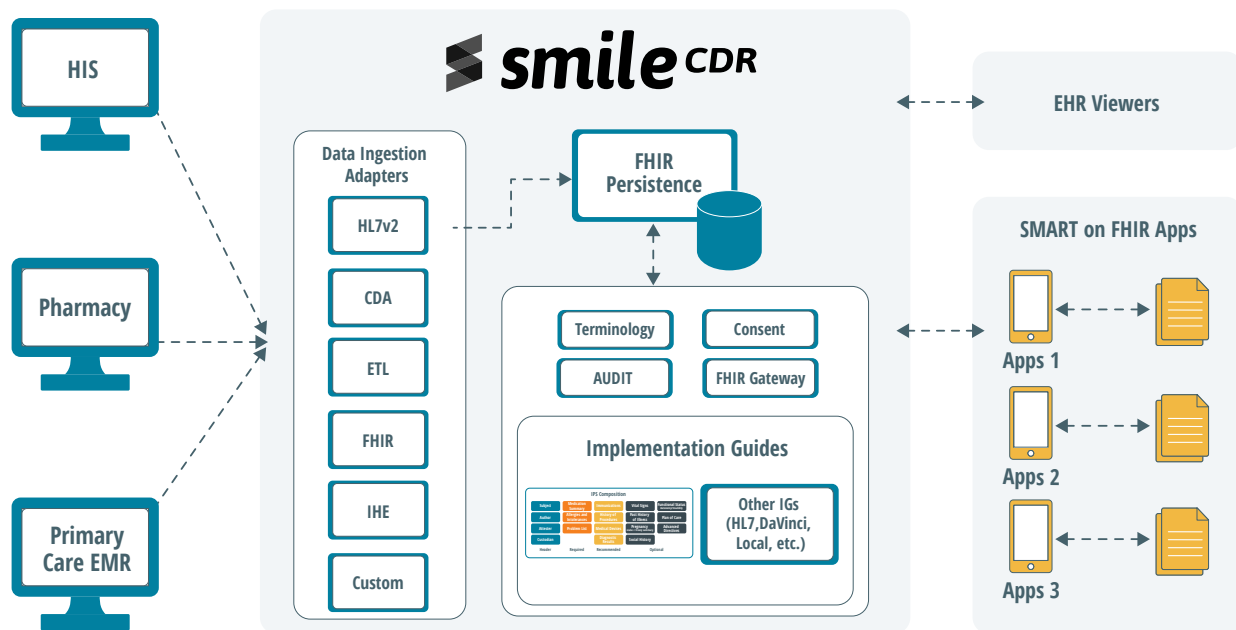
Using a FHIR-based data platform to store health information is the game-changing variable that will resolve current issues around implementation of a PS solution, making information in a patient summary easy to access and easy to consume. Realizing a FHIR-based PS solution means implementing a data repository built around the FHIR standard, such as the Smile CDR repository. Smile CDR is an enterprise FHIR-native data

platform built by the developers of the open source library HAPI FHIR. Designed around the HL7 FHIR standard, Smile CDR can easily ingest different data formats from different sources in whatever format is convenient for those sources (for example, HL7 v2, CDA, flat file, etc.). Smile CDR provides tooling to ingest clinical data using common integration patterns, as well as batch and streams-based

models. Consequently, the ability to ingest data from different sources is not a technical challenge with Smile CDR, as illustrated in Figure 2.

As the global healthcare community considers how best to implement a PS data exchange solution, the many benefits of adopting a FHIR-based data repository are clear.

Figure 2. Smile CDR Patient Summary Solution



Benefit 1: Easier and Faster Access to Data

Built-in adapters enable Smile CDR to render the format in which patient data is stored and map it to a FHIR resource. Once data is mapped to FHIR, it is preserved in this format as opposed to being transformed internally into another proprietary model. There is no vendor lock-in with Smile CDR. This also lowers implementation costs and accelerates timelines, as source systems do not need to develop new interfaces in order to convert the data stored in primary care systems into another format.

As such, the Smile CDR repository solves the challenges inherent in the third design paradigm described above. The platform's inherent flexibility means it can meet the needs of the contributing systems that have already built data connectors and data flows, so there's no need to create additional work. All data stored in the platform is available as FHIR resources, eliminating the need for source systems to transform data from a proprietary model, which creates flexibility for the receiving individual or systems that render the data and easily enables different views of patient summaries for different purposes.

When patient summary data from multiple sources (e.g., a primary care EMR, acute care HIS, etc.) is stored as FHIR resources, this enables the following:

- Predictability for any application with authorized access to the data through FHIR
- Flexibility in creating a targeted PS mapped to specific clinical workflows and allowing for specialty views
- A common platform for accessing data from multiple source systems
- The same data utilized in the PS will be the same patient data used within the patient's longitudinal health record stored in Smile CDR

From a standards perspective, Smile CDR also has built-in capabilities to support and maintain different Implementation Guides, including US Core Implementation Guides as well as the IPS Implementation Guide (IG) developed by standards development organizations. Smile CDR is also able to support different versions of the same IG, which means it can support third party applications that want to continue using old Implementation Guides while also supporting new third party applications that may want to implement a new IPS IG version.

Benefit 2: More Relevant PS Views, Improving Clinician Decision Support

With a FHIR repository like Smile CDR in which data is rendered common under the FHIR standard, there is no longer a need to be tied to a one-size-fits-all implementation approach. This means a healthcare application doesn't need to display all the data available within the PS. Instead, data can be tailored according to clinicians' specific needs based on individual use cases.

As long as a healthcare application speaks FHIR, it can access the underlying data in the PS—all the information is extracted from the source system and mapped to FHIR, allowing many different versions of a patient summary to be

rendered. Healthcare providers no longer need to contend with a patient summary that contains all information about a patient, including information that isn't relevant to their needs. Depending on a physician's practice, they can decide which fields they want to view and how they want to view the information. For example, one physician may decide the first piece of information they want to see is a patient's medication list, while another physician may decide the first piece of information they want to view is a patient's lab results. Physicians are free to tailor their PS view however they want, without any limitations.

When data is stored in a FHIR repository, queries can be made in an PS format and the consuming system will receive a PS format response. This is hugely beneficial; when information is stored as a FHIR resource, it adheres to a universal specification, making the information easy to consume. When a query is built, it can be reused for any FHIR solution in the future and doesn't need to be reconfigured to match a different system.

Benefit 3: Ability to Enhance Clinician Efficiency with SMART on FHIR

Smile CDR fully supports SMART (Sustainable Medical Applications, Reusable Technologies) on FHIR, an open standard-based technology platform that allows healthcare apps to extract data from a FHIR repository and authenticate it. With SMART on FHIR, healthcare apps can connect to the Smile CDR FHIR platform. Different SMART on FHIR applications can be developed for different clinical use cases, providing a patient summary view tailored to the needs of different types of clinicians and different workflows. SMART on FHIR also allows for one-time authentication, so the user is authenticated moving forward whenever they need to retrieve data, saving time.

There are existing SMART on FHIR apps that are already built to render IPS content, further

accelerating development timelines and lowering costs. However, although apps have been developed that can display patient information in an PS format, they're not being used because the source data they need resides in systems that are not conversant in the IPS standard.

Smile CDR can remove this barrier, making it a game changer for moving PS solutions forward. Not only does the Smile CDR platform provide a mechanism for ingesting data from source systems as described above, it offers flexibility for satisfying a wide range of clinical workflows through various displays of the patient summary using SMART on FHIR applications.

The Current State of Implementation and the Path Forward

FHIR can no longer be considered a 'new' standard. It is quickly becoming a universal standard for digital healthcare, and some governments are mandating implementation of the FHIR standard going forward.

The IPS standard has the potential to be one of the first international use case scenarios that employs the FHIR standard. In fact, initiatives are underway in some countries to make FHIR the standard for implementation of IPS solutions. For example, Argentina started a national service based on FHIR using the HL7 FHIR IPS as the first shared document, and Norway and New Zealand are looking into IPS FHIR profiles.

While there isn't yet widespread implementation of FHIR-based IPS, implementation isn't difficult, especially when using an experienced FHIR vendor like Smile CDR. FHIR-based IPS data exchange platforms have already been tested against international standards at Connectathons where vendors test their product with other vendors. This has allowed vendors of FHIR-based platforms to

validate their product and discover what works and what changes need to be made before going to market.

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Accenture works with clients, people and communities across the globe to make a world of difference. In support of this mission, Accenture helps clients to implement digital health solutions with the goal of achieving the quadruple aim of care. Recently, Accenture completed an IPS reference architecture that utilizes FHIR, further validating a FHIR-based IPS solution. Accenture also recommended Smile CDR as the core data platform, underscoring the value of a FHIR standard for IPS implementation on a general level, and, more specifically, use of the Smile CDR FHIR data repository.

Without widespread implementation of FHIR-based PS solutions, clinicians will continue to lose valuable time trying to consolidate information into a summary they can use. A FHIR-based PS solution resolves the primary challenges of data that resides in source systems and isn't readily accessible, or data that may only be available in a generic, one-size-fits-all format that can't be easily tailored in a meaningful way to meet different providers' varying needs.

Adding a FHIR-based platform like Smile CDR to a PS solution introduces a future-facing asset to the system, reducing the time spent accessing and clarifying medical information, which in turn improves patient outcomes, reduces the risk of readmission, and lowers overall healthcare costs.

Implementing a Patient Summary Solution is complex. Speak with a Smile CDR expert to discuss our straightforward solutions.

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