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eHealth Suisse

Report on the Relationship between IPS and CH eTOC

«Auslegeordnung IPS und eTOC»

Bern, 12 December 2022

ehealthsuisse
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Zweck und Positionierung dieses Dokuments:
This document responds to the question of Swiss eTOC compatibility with IPS. It has no normative character.

Contents

Summary

Subject of this report

In its request for proposal, eHealth Suisse is requiring a report to provide evidence about the commonalities and differences between the Swiss CH eTOC and the IPS. — Request for proposal

This was due to comments received after the latest CH eTOC consultation, which drove to the rejection of the proposed exchange format because of its lack of compatibility with the IPS — CH eTOC consultation results

Organisation of this report

Following eHealth Suisse's request for proposal, this report has been drafted in a first version, which has been opened to consultation by eHealth Suisse. The consultation process has provided as series of comments, which have been studied by the authors of this report by adopting the ISO way to analyse comments and their resolutions. A specific Excel file is provided with the comments, the discussion of these, the way they are resolved or the rationale for their rejection. — process for this report

Several comments are just acknowledged since they consist in statements or thoughts which might not be in the scope of the current report.

Structure of this report

The report is structured following the specific questions raised by the request for proposal. It does not discuss the appropriateness of the question but considers that the reader is familiar with the latest standards used or referenced for both CH eTOC and IPS. — Structure of the report

There are 4 main chapters (3-6) including detailed comparison between the exchange formats and followed by a discussion about any update to the Swiss CH eTOC to meet the IPS standard.

Conclusion

This report concludes by stating that both CH eTOC and IPS are unlikely to be merged so the one meets the standard requirements of the other. CH eTOC is not a base implementation of the IPS, since it requires additional elements that are not necessary for the IPS use case for unplanned care. IPS standard and implementation guides shall be followed in such a way that international interoperability can be delivered (with the European Union and other adopting countries), to support patient needs. — Conclusion

1 Context

Context

From its inception, the Swiss EPR project's vision has been to adopt and integrate international standards such as ISO or HL7 FHIR among others.

A number of individual projects were already defined before the development of international standards. This has resulted in the need for maintenance and update work in Switzerland to remain consistent with the vision of international conformity and interoperability.

The International Patient Summary (IPS) is a good example of an international development that affects Switzerland. Along with the HL7 FHIR implementation guide, it was adopted as a work item by CEN TC 251 and has rapidly become an ISO standard. The IPS is a dynamic project which is already undergoing some revisions to retain backward compatibility while also adding new data sets (or data blocks) that meet the demands of those implementing it.

About Medinorma LLC

Medinorma's mission is to provide support and input in the area of health informatics, specifically in the domain of supply chain security. This includes patient identification, bedside scanning, counterfeit prevention, hospital logistics, product traceability, and interoperability with other standards such as ISBT128, among others.

According to its mandate from the GS1 Global Office, Medinorma is coordinating the GS1 supply chain standards within health informatics. This includes active engagement with various organisations, such as ISO TC 215 and CEN TC 251, which have developed the IPS standard and the accompanying HL7 FHIR implementation guide, as well as involvement with SNOMED CT and other standards.

In 2021, Medinorma and other stakeholders, organised a Joint Initiative Council openForum to discuss and shed light on interactions between standards for the global community. (See https://youtu.be/JDPAWAL9LaQ and https://youtu.be/7YWb8ADmSxI).

This report is divided into four main chapters, in accordance with eHealth Suisse's RFP. It does not include a long description of eTOC (as is) or IPS, which form the background to the current project, since these subjects are already well known and understood.

References

EN ISO 27269:2021 (current revision as necessary)

CEN TS 17288 IPS Guideline for European Implementation

HL7 FHIR IPS IG

IHE IPS profile (as necessary)

2 How IPS can be implemented in the Swiss EPR

2.1 Potential benefits of the IPS as an exchange format in the context of the Swiss EPR

Chronology

The objective of CEN TC 251, as directed by the European Commission (EC), is to give European citizens the ability to give their clinicians and healthcare providers access to essential health information while travelling outside their country of residence. This was deemed a necessary step to align EU citizens' fundamental right to freedom of movement with Member States' rights to retain competence over their own health systems. Under the terms of the EU treaty, the EC is not in a position to regulate how health data is collected, managed and transmitted within Member States.

The secondary objective for the EC was to facilitate access to non-elective (unplanned) health procedures. Standardisation experts noted that emergency care, which may be politically important, had not been considered significant in health IT projects such as the current one.

Standardisation work

Standardisation experts chose to define a series of essential bricks (data-sets) which group together minimal patient information to help clinicians in their work with non-resident patients. This would meet both intra-EU needs and the needs of heterogeneous health systems more generally, wither within a single country or between jurisdictions, regardless of their relationship with the EU. In addition, the standardisation experts opted for international standards as ingredients for what has become the IPS.

By using the essential data-sets, implementing countries or jurisdictions will be able to enrich the content of the patient summary with information on, for example, immunisation or family history and genetics.

2.2 The IPS in Switzerland and elsewhere

Switzerland

Implementing the IPS in Switzerland means that patient health data will be standardised so it can support care beyond the patient's normal place of residence, both within Switzerland and abroad, legal conditions permitting. It also means that the use of the IPS will apply to all health issues, not just emergency (or unplanned) clinical care.

The IPS has been designed to allow the retrieval of patient health information from electronic health record(s) at any time. Consequently, healthcare providers must be able to generate the IPS on demand by collecting data from distributed systems.

GDHP

The international community has recognised the benefit of the IPS as a means to increase patient safety. That is why the G7 adopted the IPS at its

June-July meeting in 2021 (in Oxford, UK), which is then reflected in the roadmap, published in December 2021[1].

The Global Digital Health Partnership (GDHP) also includes a workstream on interoperability with the aim of identifying gaps and barriers and then adopting directions to improve interoperability. The IPS is part of this way forward. The WHO, which is also a member of the GDHP, is also working on IPS adoption as a priority for Low and Middle Income Countries. As a result of these combined efforts, the number of partial IPS implementations has grown rapidly, as have the number of implementation projects at early stages[2].

The NHS HELM proof of concept is one of the more remarkable implementations to date and has been presented to various audiences. Interestingly, the HELM proof of concept is based on the patient's engagement (as this video from December 2021 demonstrates: https://youtu.be/zpPlZNSvSB0). More common are examples based on clinician engagement, with patient consent, such as those in Argentina and Canada among others.

Canada

Canada in particular presents in interesting example for Switzerland. Like the Swiss Cantons, Canadian provinces have different levels of digitalisation and patient summary adoption co-existing alongside a federal government that is driving IPS implementation. As a GDHP and G7 member, Canada is committed to implementing the IPS. Its project started under the leadership of Canada Health Infoway, and covered Alberta, British Columbia, Newfoundland and Labrador, Ontario, and Saskatchewan Provinces. Meeting the different needs of its provinces, means that Canada cannot implement the IPS in full. However, its pan-Canadian Patient Summary and implementable specifications are as close to IPS as is possible while still taking into account the requirements and competences of the provinces and the federal government.

Canada's staged approach to building to Release 1 of Patient Summary-CA (PS-CA) starts with the following three use cases:

- The healthcare provider (HCP) creates and submits a PS-CA.
- The HCP retrieves, views and uses the PS-CA.
- The patient accesses and views their PS-CA.

Before adopting the PS-CA there was *"no standardized patient summary or record sharing between provinces or even individual health authorities within a province or territory."*[3] The learning process, which involved local branches of standard development organisations, such as ISO, HL7, IHE, and SNOMED CT, and stakeholders found wide-ranging acceptance. It is notable that the subject of care (the patient) is invited to play a central role

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[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1045268/G7-international-patient-summary-roadmap.pdf

[2] https://international-patient-summary.net/category/topics/inplementations-globe/)

[3] Value-of-the-IPS-in-Canada-v11-03-2021.pdf (digitalhealthcanada.com)

through accessing their medical record. This requires that they be made aware of IPS benefits, for example by using digital apps. Healthcare professionals are also to be informed about IPS's value. Regarding healthcare providers, a successful IPS implementation will include adequate compensation for the extra time required to properly update patient information in the new system.

2.3 Regulatory considerations

The current regulatory framework in Switzerland does not provide sufficient requirements for the implementation of the IPS, even if this country is a member of the GDHP, which encourages its members to implement this standardised tool. Additions in the Swiss regulatory framework should be considered, possibly in light of the learnings from the COVID-19 pandemic.

Even if Switzerland is not in close relationship with the EU, Subjects of care from Switzerland may travel in European countries and need (or decide) to give access to their IPS to care givers in unplanned situations. That pleads for an IPS implementation in this country, which follows the standards and considers what the eHealth Network recommends for EU/EEA.

The same applies for EU/EEA Subjects of care visiting Switzerland as tourists or for other reasons.

3 IPS as an exchange format for the Swiss EPR

3.1 Potential benefits of the IPS as an exchange format in the context of the Swiss EPR

IPS HL7 references

The IPS is an extract of an electronic health record that contains essential healthcare information about a subject of care. An IPS document is divided into two parts: one containing structured data and one containing narrative text. HL7 workgroups have developed, balloted, and published two implementable specifications for the IPS. These are based on these standards: HL7 CDA IPS STU, from October 2018 and HL7 FHIR IPS STU (FHIR Release 4) from May 2020[4]. Both implement the same domains of clinical data: allergies, medications and problems required. These were originally advanced by CEN TC 251 health informatics and are now carried forward by ISO TC 215 as the ISO 27269 standard for IPS datasets.

Swiss EPR

The Swiss EPR enables the storage of documents, including narrative documents in pdf format, as well as documents containing structured data. eHealth Suisse relies on the HL7 FHIR standard for the development of new exchange formats[5]. The list of different technical formats is defined in Annex 3 to EPRO-FDHA[6]. Exchange formats also define syntax and semantics that enable additional, automated processing of data in IT systems. Specifications for both the technical implementation and the content of data elements will be contained in Annex 4 to EPRO-FDHA. The next revisions of Annex 4 are expected to cover exchange formats for vaccination and immunisation (CH VACD), and medication (CH EMED), both of which are specifications based on the FHIR standard.

The GDHP collaboration, of which Switzerland is part, also works with IPS implementation guides based on FHIR. It is strongly recommended, therefore, that the FHIR IPS document format is added as an official exchange format to the Swiss EPR.

IPS lifecycle/process

However, listing the IPS as an exchange format does not yet address how best to handle the lifecycle management or processes around IPS. Various architecture and governance principles are evolving internationally, which may possibly be included within the Swiss EPR architecture:

1. Via primary systems, healthcare professional publishes an IPS document into the Swiss EPR at a specific point in time (e.g. discharge). This records an important milestones in the patient's journey.
2. One centrally managed IPS within the Swiss EPR.
3. Dynamically generated IPS based on the information in the Swiss EPR.

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[4] https://blog.hl7.org/advancing-the-international-patient-summary-ips
[5] https://www.e-health-suisse.ch/technik-semantik/semantische-interoperabilitaet/austauschformate.html
[6] https://www.bag.admin.ch/epra see SR 816.111

Chapters 3.2 to 3.4 have the purpose to explain the 3 possible solutions and their potential relations or impact on the Swiss EPR

3.2 IPS published to the Swiss EPR by healthcare professionals via primary systems

IPS Use Case

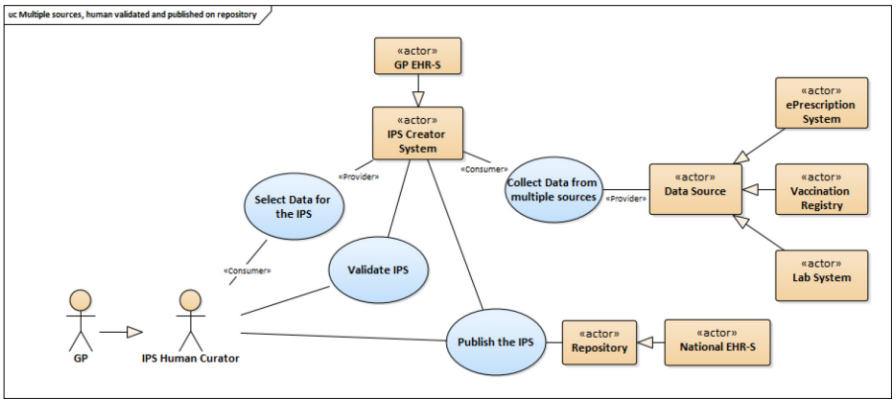

Figure 1: IPS use case[7]

In this use case, a healthcare professional creates an IPS document from the available patient data in a primary system, validates that information, and publishes it to the Swiss EPR.

Each new IPS document is stored in the patient's Swiss EPR. The patient can give access rights to their IPS document to other actors in accordance with Swiss EPR rules.

This use case can be integrated into the Swiss EPR with minor modifications, as it follows the same process for publishing any document in the Swiss EPR.

- For querying and publishing, XDS metadata for the IPS needs to be specified according to Annex 3 to EPRO-FDHA.
- IPS documents should be added as an exchange format in the EPR context according to Annex 4 to EPRO-FDHA.
- Patient and healthcare portals should be required to render the narrative component of the IPS document, and have an integrated IPS viewer.
- Primary systems need to be able to create and publish an IPS document.

[7] Source: https://confluence.hl7.org/display/SEC/International+Patient+Summary%3A+Use+Cases

3.3 Centrally managed IPS within the Swiss EPR

Instead of having multiple snapshots of IPS documents in the Swiss EPR, a community could also make a centrally managed IPS document available. The IPS would then be managed and curated by healthcare professionals within the EPR community, enabling the patient to delegate access to other healthcare professionals and to download a copy for use while abroad. This architecture would be similar to that being piloted for eMedication in the context of the EPR (get medication list, get medication card[8]) or as is being proposed for the future vaccination module[9].

As for eMedication and the future vaccination system, an additional 'IPS' module would need to be developed and then deployed by the EPR community. This would enable the IPS to be displayed and modified in a GUI and allow information from other exchange formats to be consolidated with it. It would also have the necessary logic to perform the required EPR publication.

3.4 Dynamically generated IPS, based on inf. in the Swiss EPR

Certain projects envision an automatic generation of IPS based on available information. For example, if current medications, vaccinations and allergies are already available in the Swiss EPR, an IPS could be generated based on this data. Such a solution is not possible within the current architecture. However, if a central repository for dynamic data should become possible (see MOFH communication[10]), automatic generation of IPS documents could be implemented in the Swiss EPR.

HL7 is proposing a new FHIR operation[11] in the IPS implementation guide[12] which allows for the dynamic creation of an IPS document. Vendors demonstrated the first prototypes at the HL7 FHIR Connectathons[13]. Dynamic generation also opens up the possibility of translating the coded information into the language of the requester.

Dynamic generation of documents is currently not covered by Swiss EPR law, and would therefore need to be introduced.

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[8] https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/E/report-emedication-architecture-epr.pdf
[9] https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/D/Infonotiz_Impfausweis_im_EPD_de.pdf
[10] https://www.bag.admin.ch/bag/de/home/das-bag/aktuell/medienmitteilungen.msg-id-88245.html
[11] https://jira.hl7.org/browse/FHIR-32014
[12] https://hl7.org/fhir/uv/ips/STU1.1/ipsGeneration.html - generating--accessing-ips-documents
[13] https://confluence.hl7.org/display/FHIR/2022-05+International+Patient+Summary

3.5 Summary

The three approaches to IPS implementation in the Swiss EPR can coexist. Since the Swiss EPR is starting with exchange formats that could be the inputs for a central or dynamic generated IPS, we recommend following a bottom-up approach as eHealth Suisse has done for eMedication and vaccination and immunisation.

eHealth Suisse is coordinating with HL7 Switzerland and GDHP to confirm that Swiss implementation complies with IPS standards. In addition, sample IPS documents, which are based on national exchange formats for medication and vaccination, for example, have to be developed and verified to ensure they are in accordance with the FHIR IPS implementation guides (see Swiss samples for the GDHP Connectathon). The existing exchange formats for medication, vaccination and immunisation and allergy and intolerance also need to be verified to confirm that they comply with IPS standards.

To facilitate implementation of IPS documents in primary systems and verify the maturity of such implementations, validation and testing should be offered at the yearly Swiss Projectathon.

4 Is CH eTOC an IPS implementation?

4.1 eTOC / Transition of Care as an exchange format in Switzerland

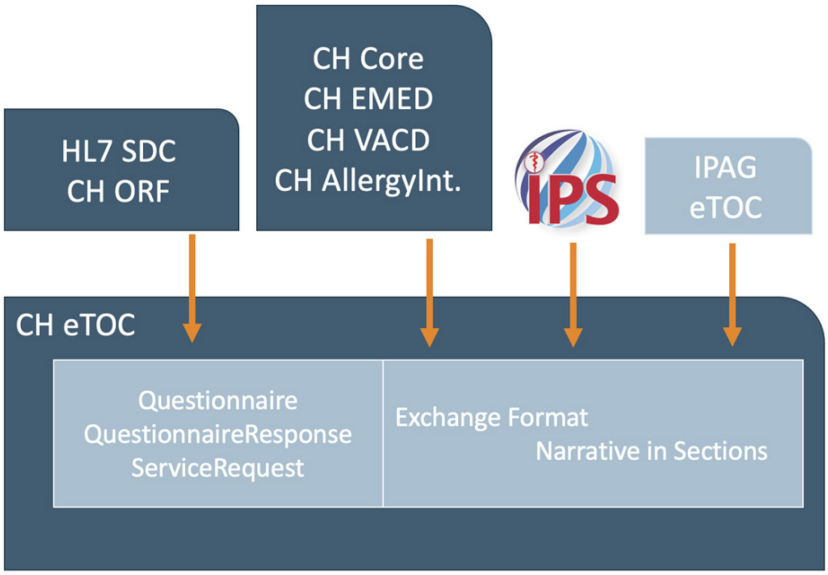

Figure 2: HL7 and Swiss FHIR implementation guides

IPAG recommendations

The December 2018 IPAG eTOC report[14] presents recommendations for the interdisciplinary use of the most important information modules for the transition of treatment. These recommendations are to be used and leveraged in electronic Transition of Care (eTOC) documents for inter-professional communication, such as transfers and treatment transitions. These data modules can be used independently of each other in other documents such as discharge reports.[15]

The IPAG eTOC report proposes a standardised designation for the contents of a document (section designations) to ensure standardised exchange of information. The 14 proposed section designations can be adapted and supplemented to meet the specific needs of individuals and occupational groups. Sections may contain free text, structured, or coded information, or a combination thereof. The use of free text information will remain provided for at all times.

CH eTOC

The FHIR implementation guide (IG), CH eTOC[16], has been developed by the HL7 Switzerland Joint Venture Working Group eTOC[17] with eHealth Suisse and IPAG. eHealth Suisse provided guidance for this work.

[14] https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/2018/D/181206_eTOC-eUeberweisungsbericht-IPAG_d.pdf
[15] https://www.e-health-suisse.ch/technik-semantik/semantische-interoperabilitaet/austauschformate.html
[16] http://fhir.ch/ig/ch-etoc/index.htm I
[17] https://www.hl7.ch/de/technisches-komitee

At the working group meeting in February 2021, it was decided that a first version of CH eTOC will be based on the FHIR IPS IG International. The Swiss implementation guide went through a ballot process in 2021 for STU1 (Standard for Trial Use). One company participated at the Projectathon for testing during the ballot. Two negative comments, which questioned the decision of the working group to be close to the IPS and to reduce the IPAG eTOC to its original goals as per the report recommendations, could not be resolved during the ballot[18].

CH ORF

The CH eTOC implementation guide was developed based on the Swiss implementation guide CH ORF (order and referral by forms) and in accordance with the recommendations of the Swiss eHealth Exchange Format Handbook[19]. It adds elements to the exchange format not contained in the ORF.

The CH eTOC defines a Questionnaire for user input, an (optional) rendered pdf, and the structured exchange format based on IPS and conform to the following Swiss implementation guides: CH Core, CH EMED (medication), CH VACD (vaccination and immunisation) and CH AllergyIntolerance.

As a consequence, CH eTOC is not a base implementation of IPS, since it requires additional elements that are not necessary for the IPS use case for unplanned care.

CH eTOC builds upon the IPS library of content profiles and is close to IPS as an exchange format. The first version of CH eTOC still allows many free text entries. Derivations for use cases in different disciplines are to be defined later. This is stated explicitly in the implementation guide: *"as a consequence, the first version of CH eTOC does not claim to be conformant to IPS".*

[18] http://fhir.ch/ig/ch-etoc/changelog.html#negative-comments-which-could-not-be-resolved-during-the-ballot

[19] https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/E/Exchange-format-handbook_part-1_v12.pdf

5 FHIR IPS and CH eTOC commonalities

5.1 Context

HL7 workgroups have developed, balloted, and published two implementable specifications for the IPS. These are based on these standards: HL7 CDA IPS STU, from October 2018 and HL7 FHIR IPS STU (FHIR Release 4) from May 2020. For comparison, the FHIR-based implementation is currently used because it is under current active development within GDPH. Since its publication in May 2020, the FHIR-based implementation has undergone significant changes (see IPS publication updates from September 2022[20].) For comparison, the latest STU1.1 version (v1.1.0 – 22.11.2022) has been used (version history[21]).

CH eTOC has also been further developed since the balloted STU1 version. For comparison, the latest continuous integration build which has been used is CH eTOC: v1.1.0 – 07.12.2022[22] (version history and change log are not yet updated; see GitHub commits since August 2022), with dependency on FHIR IPS v1.0.0.

The commonalities are analysed on three different levels:

- Project scope of FHIR IPS and CH eTOC.
- FHIR IPS and CH eTOC document.
- Profiled resources comparison in FHIR IPS and CH eTOC.

5.2 Project scope for FHIR IPS and CH eTOC

IPS and CH eTOC both specify a document for exchange. Table 1 compares the two, with IPAG eTOC report added for additional comparison.

	FHIR IPS	CH eTOC	IPAG eTOC
Document	Electronic health record extract containing essential healthcare information about a subject of care.	Order and referral by form with treatment-relevant information about a subject of care.	Electronic referral exchange format with treatment-relevant information about a subject of care.
Primary use case scenario	Unplanned, cross border care (although not limited to this).	Support for planned and unplanned care[23], inter-	Intra- and inter-professional exchange of

[20] https://chat.fhir.org/#narrow/stream/207835-IPS/topic/IPS.20Publication.20Updates.20.28Sept.202022.29
[21] http://hl7.org/fhir/uv/ips/history.html
[22] https://github.com/hl7ch/ch-etoc/releases/tag/etoc-ips
[23] Unplanned care: if a referral is carried out in the context of unplanned care

		professional exchange during transition of care.	information during transition of care.
Application area	International/global, as well as within country.	National (directional communication between order placer and order filler as well as future exchange format for the Swiss EPR).	National between healthcare professional/ institution and the follow-up institution/healthcare professional.
Point in time	Snapshot in time	Snapshot in time	Snapshot in time
Data set	Minimal/non-exhaustive, specialty-agnostic, condition-independent, clinically relevant.	Speciality-dependent, condition-dependent.	Speciality-dependent, condition-dependent.
Data elements	Sets of core data items indicated as IPS Library (see Figure 3).	Data elements and their items defined by order and referral by form and corresponding exchange format based on the IPS library.	No data elements defined, recommendation for CodeSystem/ValueSets, use Swiss exchange format data elements in the future.

Table 1: Scope comparison

The documents contain essential treatment-relevant healthcare information about a subject of care (the patient). The IPS document is primarily used but not limited to unplanned care. Consequently, the IPS use case scenario is broader than the CH eTOC primary use case, which covers planned and unplanned care within Switzerland. Because the CH eTOC focus on planned care, the CH eTOC document presents both essential healthcare information as well as other information relevant to treatment in the context of care transition.

This also creates a difference in the data set(s) required. Although both documents are a snapshot in time of a patient's healthcare information, the CH eTOC document is more comprehensive than the minimal/non-exhaustive data set presented in the FHIR IPS document. Furthermore, the IPS dataset is specialty-agnostic and condition-independent. In contrast, CH eTOC describes a speciality-dependent and condition-dependent dataset.

Both documents can be used in the national area. Although FHIR IPS focuses more on international/global information exchange, this does not preclude national use, which is intended in CH eTOC.

CH eTOC is based on the Swiss implementation guide CH ORF. The

process described therein is based on structured data capture. Information is captured by the sender by means of a form, mapped to the exchange format, and then transmitted to the recipient. IPS does not define a form for data entry, only the data elements to be captured. The CH eTOC also covers the data elements described in the IPS Library.

IPS Library

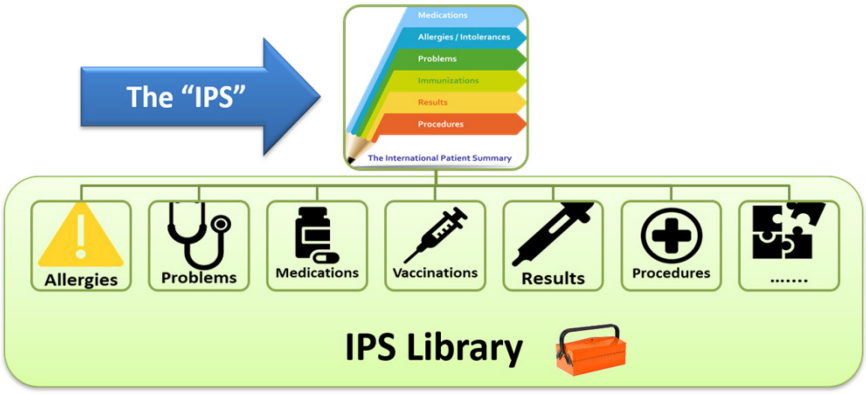

Figure 3: IPS library[24]

The IPS library includes well-defined and potentially reusable sets of core data items, as shown in Figure 3. CH eTOC uses these defined data elements in its own document. By relying on the IPS library and the ability to extend the form, CH eTOC ensures potential reusability beyond its intended scope.

[24] Source: https://hl7.org/fhir/uv/ips/

5.3 FHIR IPS and CH eTOC document

The content of the documents can be shown on the basis of the IPS Composition. It has a 'Header' (shown in blue in Figure 4 and throughout this report) and 14 different sections that contain the essential healthcare information about a subject of care (shown as red, orange, or green in Figure 4).

IPS composition

Figure 4: IPS Composition[25]

For clarity around wording and definitions in the text that follows, the following document definitions are from the FHIR core standard[26]:

- *"FHIR resources can be used to build **documents** that represent a Composition: a coherent set of information that is a statement of healthcare information, including clinical observations and services. A document is an immutable set of resources with a fixed presentation that is authored and/or attested by humans, organizations and devices."*
- *"All documents have the same structure: a Bundle of resources of type 'document' that has a **Composition** resource as the first resource in the bundle, followed by a series of other resources, referenced from the Composition resource, that provide supporting evidence for the document."*

As noted above, the content of the FHIR IPS and CH eTOC documents both conform to the IPS Composition. However, the structural design of the documents, including design conventions and principles, differ, as shown in Table 2. The IPAG eTOC report has again been added for comparison purposes.

[25] Source: https://hl7.org/fhir/uv/ips/
[26] https://www.hl7.org/fhir/documents.html

	FHIR IPS	CH eTOC	IPAG eTOC
Document structure	FHIR document (Bundle) with first entry profiled as FHIR IPS composition.	FHIR document (Bundle) with first entry profiled as CH eTOC composition.	Not specified, but needs to be an exchange format for the Swiss EPR[27].
Document metadata	Information like subject of care, author of the document etc. are represented in the IPS Composition as header elements (shown in blue throughout this document).	The CH eTOC Composition contains the generic elements, like subject of care, author of the document and further, also Swiss specific, elements.	The administrative metadata according Swiss exchange format are not discussed in this document.
Document sections	The IPS Composition is divided into different sections, which contain the essential healthcare information about a subject of care: Required (shown in red) Recommended (shown in orange) Optional (shown in green)	The Composition is divided into different sections. There are sections with healthcare information, analog to the IPS sections. In addition, one section provides the data that supports the order and referral by form and another section contains the original representation.	There are 14 proposed sections. Their headings can be adapted and supplemented according to the needs of individuals and professional groups. The sections are not divided analogously to the IPS.
Sections order	The sections can be in arbitrary order and more can be added.	The sections can be in arbitrary order and more can be added. But the rendering is defined by the form.	The order of the sections can be freely adjusted by all participants according to local needs.
Narrative text	The IPS Composition includes a requirement for each section to have human-readable narrative text. The IPS IG doesn't require narrative text for other resources included in an IPS document.	The narrative text for all sections is not required.	The use of free text information will remain provided at all times.
Structured data	Structured data is required for the required (red) and recommended (orange) sections.	The required section 'orderReferral' requires structured data. No other sections require structured data.	No requirements for structured data. Sections may include free text, structured, and coded information, or a combination thereof.

[27] https://www.e-health-suisse.ch/technik-semantik/semantische-interoperabilitaet/austauschformate.html

Table 2: Document comparison

	Comments
Both the FHIR IPS and CH eTOC documents are specified as FHIR documents. Both have a header component for generic information and a component that is divided into sections that contain healthcare-specific information. These sections can be presented in any order, and additional sections can be added. For CH eTOC the way the document is rendered is defined by the form. CH eTOC describes a document which, in addition to the sections with healthcare-specific content, has additional sections covering the context of order and referral by form. The FHIR resources Questionnaire and QuestionnaireResponse are used for form data. The ServiceRequest resource is used to map the data from the form in a structured way. A pdf with the original representation can be provided. Narrative text is described as mandatory for each section in FHIR IPS. However, it is described as optional in CH eTOC, which can use either the form response or the original representation (e.g. pdf) as a narrative text. Structured data derived from resources referenced in the corresponding sections is required in FHIR IPS for the required and recommended sections. In the CH eTOC, structured data is mandatory only in the required section 'orderReferral'. In all other sections, structured data is optional.	

5.3.1 IPS Design Conventions and Principles

A separate section, 'Design Conventions and Principles', exists in the FHIR IPS implementation guide. It describes how absent data and the 'Must Support' principle are to be handled[28]. CH eTOC dos not cover so far these elements.

5.3.2 Representing 'known absent' and 'not known'

The design of FHIR IPS enforces the use of the terms 'known absent' and 'not known' in required sections (shown in red in this report's figures and tables). The emptyReason attribute cannot therefore be used in required sections.

In the recommended sections (shown in orange in this report's figures and tables), 'known absent' and 'not known' can also be explicitly stated. Alternatively, the section may be omitted entirely.

It is expected that all other sections will be omitted where information is absent.

[28] https://hl7.org/fhir/uv/ips/STU1.1/design.html

5.3.3 'mustSupport'

'mustSupport' is a rule within FHIR. It means that implementations which produce or consume resources must provide 'support' for the element concerned in some meaningful way. This is distinct from cardinality. It is possible to have an element with a minimum cardinality of '0', but still expect systems to support it. However, 'support' is not defined by the base FHIR specifications[29].

For FHIR IPS, the type of 'support' required is in accordance with the IPS standard, and is described in the implementation guide as follows:

For clarity around wording and definitions in the text that follows, the following document definitions are from the FHIR core standard[30]:

"*Implementers conforming to an IPS document in the IPS implementation guide:*

- *SHALL be capable of supporting profiles under sections that are marked mustSupport in the IPS Composition profile*
- *SHALL be capable of populating profiles for allergy, medication and problem information in an IPS document*

Missing data:

- *Optional mustSupport data elements (cardinality of 0..1 or 0..*): If an IPS creator (a system generating the IPS contents) does not have data to be included in the IPS, the data element is omitted.*
- *Required mustSupport data elements (cardinality of 1..1 or 1..*): If an IPS creator does not have data to be included in the IPS, the reason for the absence has to be specified.*

The mustSupport principle in the FHIR IPS is to align with the underlying ISO 27269 standard for when information has elevated importance[31]. See Google Sheet for mapping FHIR IPS/mustSupport and ISO 27269[32]."

[29] http://hl7.org/fhir/profiling.html#mustsupport
[30] https://www.hl7.org/fhir/documents.html
[31] https://chat.fhir.org/#narrow/stream/207835-IPS/topic/IPS.20Publication.20Updates.20.28Sept.202022.29
[32] https://docs.google.com/spreadsheets/d/15hNGV7Hol76pA73C5XCx_rHOoSYfG8E56PboF3ij9-k/edit#gid=942346437

6 Profiled resources comparison FHIR IPS and CH eTOC

6.1 Context

When comparing the contents of the FHIR IPS and CH eTOC documents, the profiled FHIR resources are used to create a differentiated and detailed comparison. This is based on the FHIR IPS, in which the IPS structure is described in the same way[33]. All existing works are compared against this structure and, if necessary, additional elements are added.
The comparison is illustrated in tables like those above and includes a brief description of the content, optionality/cardinality, and representation of the structured data (FHIR resources) in each case.

The following optionalities have been defined in the corresponding works: Optionalities

- FHIR IPS
  - Sections[34]
    - ® = required section, which must be present in a FHIR IPS document (red)
    - (S) = recommended section (orange)
    - Optional section (green)
  - MS = mustSupport

- CH eTOC
  - MS = mustSupport

6.2 Header – Composition

The header information (shown in blue) is mapped in the FHIR Composition itself in respect to resources referenced from the Composition. It is administrative data, as would be represented in the header of a standard letter.

	FHIR IPS	**CH eTOC**
Subject	Who and/or what the composition is about (the patient).	Patient as the principal target of a particular form content.
	1..1 MS Patient (IPS)	1..1 MS CH Core Patient
Author	Who and/or what authored the IPS.	The person/organisation responsible for the form content.

[33] https://hl7.org/fhir/uv/ips/STU1.1/ipsStructure.html
[34] https://hl7.org/fhir/uv/ips/STU1.1/ipsStructure.html#list-of-profiles

	1..* MS Practitioner | PractitionerRole | Device | Patient | RelatedPerson | Organization	1..1 MS CH Core PractitionerRole
Attester	Attests to accuracy of composition.	Attests to accuracy of composition.
	0..* MS Patient | RelatedPerson | Practitioner | PractitionerRole | Organization	0..* CH Core Patient | RelatedPerson | CH Core Practitioner | CH Core PractitionerRole | CH Core Organization
Custodian	Organisation which maintains the composition.	Organisation which maintains the composition.
	0..1 MS Organization	0..1 CH Core Organization
Data Entry Person	-	The person/organisation who has typed/filled in the form content.
	-	0..1 MS CH ORF Extension: CH Core PractitionerRole
Urgent Notification Contact for this document	-	An information recipient to notify for urgent matters.
	-	0..1 MS CH ORF Extension: CH Core PractitionerRole
Urgent Notification Contact for the Response to this document	-	An information recipient to notify for urgent matters about the response.
	-	0..1 MS CH ORF Extension: CH Core PractitionerRole
Receiver	-	Person/organisation who receives the document.
	-	0..1 MS CH ORF Extension: CH Core PractitionerRole
Copy Receiver	-	Person/organisation who receives the copy of this order.
	-	0..* MS CH ORF Extension: CH Core PractitionerRole | CH Core

		Patient | RelatedPerson
Antecedent Episode of Care	-	Documentation of a preceding episode of care e.g. hospitalisation in case of care transfer between institutions such as hospitals, rehabilitation clinics, nursing homes etc.
	-	0..1 MS CH ORF Extension: CH ORF Episode of Care
Initiator	-	Who initiated this order; in particular for 'Spitex' and transfer to nursing home etc.
	-	0..1 MS CH ORF Extension: CH Core PractitionerRole | CH Core Patient | RelatedPerson
Patient Consent	-	To specify if the patient gave an informed consent to this order; in particular f'r 'Spitex' and transfer to nursing home etc.
	-	0..1 MS CH ORF Extension: CH ORF Consent

Table 3: Comparison of FHIR IPS and CH eTOC document headers

Comments

As shown in Table 3, the FHIR IPS and the CH eTOC documents contain four header elements. These are defined in the IPS Composition. The four common header elements differ slightly when it comes to cardinalities and 'mustSupport'. The resources referenced by the elements match in terms of resource type, with the exception of 'Author', where the CH eTOC is more restricted. However, the different profiles (specific, context-dependent restrictions) should be noted here. The FHIR IPS uses the FHIR Core profiles and defines an IPS profile for the 'Patient', whereas the CH eTOC uses the Swiss-specific CH Core profiles for all four header elements.

The CH eTOC also adds elements to the header; these are defined as extensions in the implementation guide CH ORF, from which it is derived.

6.3 Header 'mustSupport' comparison

IPS Profile	FHIR IPS	IPS[35]	CH eTOC Form	CH eTOC Profile	Comment
Bundle	timestamp (1..1) MS	M	not applicable	timestamp (1..1) MS	
Composition	subject (1..1) MS	M	patient	subject (1..*) MS	
	date (1..1) MS	M	not applicable	date (1..1)	
	author (1..*)	M	sender.author	author (1..1) MS	Card. diff.
	attester (0..*)	RK	-	-	Concept not used in eTOC
	custodian (0..1)		author.organization	custodian (0..1)	mustSupport diff.

Table 4: Comparison of FHIR IPS and CH eTOC 'mustSupport' header attributes

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

6.4 Patient attribute with mustSupport

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Patient	identifier (0..*) MS	RK	localPID / localPIDDomain AHVN13	identifier (0..*)	no mustSupport
	name (1..*) MS	M	familyName (0..1) givenName (0..1) maidenName (0..1)	name (0..*)	Card. diff., no mustSupport
	telecom (0..*) MS	RK	phone (0..*) email (0..1)	telecom (0..*)	no mustSupport
24irthdateate (1..1) MS24irthdatea te (0..24irthdatea	Card. diff., no mustSupport				

te (0..1)					
	address (0..*) MS	RK	streetAddress Line postalCode city country	address	no mustSupport
	generalPractitioner (0..*) MS	RK*	familydoctor (0..1)	generalPractitioner (0..*)	Card. diff. form, no mustSupport, IPS can have multiple persons/ organisations for cross-border use case.

Table 5: Comparison of FHIR IPS and CH eTOC 'mustSupport' patient attributes

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Comparing the 'mustSupport' requirements of the FHIR IPS and the CH eTOC for header and patient attributes shows that it is possible for CH eTOC to create documents that do not conform to IPS instances, due to different cardinalities (e.25irthdateate not required). If the goal is to produce an IPS-conforming document, the 'mustSupport' definition should be aligned with IPS. T'e 'Attester' concept in IPS is not used in CH eTOC.

Comments

6.5 Healthcare Information – Sections

Both FHIR IPS and CH eTOC map healthcare information in sections. A code is defined for each section to identify that section. Narrative text is represented in the section itself. Structured data is mapped into resources referenced from entries in the sections.

The sections of both implementation guides are compared in Table 6 below, with the sections from the IPAG eTOC report added for comparison.

	FHIR IPS[36]	**CH eTOC**	**IPAG eTOC**
Medication Summary	Description of patient's relevant medications for the scope of the patient summary.	Medication: Information about the medication.	**'Medikation':** Current medication; entry/exit medication; stopped/changed medication.

[36] https://hl7.org/fhir/uv/ips/STU1.1/ipsStructure.html#sections-description

	(R) → 1..1 MS Medication Statement (IPS) | MedicationRequest (IPS) (MedicationAdministration | MedicationDispense)	0..1 MS CH EMED MedicationStatement	Optional (may be required in the future)
	LOINC 10160-0 History of Medication use Narrative	LOINC 42346-7 Medications on admission (narrative)	-
Allergies and Intolerances	Relevant allergies or intolerances, describing type of reaction (e.g. rash, anaphylaxis); preferably the agents that cause it; and, optionally, the criticality and certainty of the allergy.	Allergies and intolerances: Information about allergies and intolerances.	**'Allergien und Unverträglichkeiten':** Known (confirmed/ unconfirmed) allergies and intolerances.
	(R) → 1..1 MS Allergy Intolerance (IPS)	0..1 MS CH eTOC Allergy Intolerance	Optional (may be required in the future)
	LOINC 48765-2 Allergies and adverse reactions Document	LOINC 48765-2 Allergies and adverse reactions Document	-
Problem List	Clinical problems or conditions currently being monitored.	Problems: Problem List	**'Probleme':** Diagnoses and problems, including primary/ secondary diagnoses, major/minor problems, suspected diagnoses/ problems, symptoms, health conditions, etc.
	(R) → 1..1 MS Condition (IPS)	0..1 MS CH eTOC Primary Diagnosis Condition | CH eTOC Secondary Diagnosis Condition	Required
	LOINC 11450-4 Problem li–t - Reported	LOINC 57852-6 Problem list Narrati–e - Reported	-
Immunisations	Current immunisation status and pertinent immunisation history.	Immunisations: Information about immunisations	See section 'Anamnese'
	(S) → 0..1 MS Immunisation (IPS)	0..1 MS CH eTOC Immunisation	-

	LOINC 11369-6 History of Immunisation Narrative	LOINC 11369-6 History of immunisation Narrative	-
History of Procedures	Description of past procedures that are pertinent to the scope of the IPS.	History of procedures	**'Behandlungen':** Therapeutic interventions, preventative measures, education, therapeutic goals, **implants**, instructions, etc.
	(S) → 0..1 MS Procedure (IPS)	0..1 MS CH eTOC Procedure	Optional
	LOINC 47519-4 History of Procedures Document	LOINC 47519-4 History of Procedures Document	-
Medical Devices	History of medical device use.	Medical devices: Information about medical devices	See section 'Behandlungen'
	(S) → 0..1 MS Device Use Statement (IPS)	0..1 MS CH eTOC Device	-
	LOINC 46264-8 History of medical device use	LOINC 46264-8 History of medical device use	-
Diagnostic Results	Relevant observation results collected on the patient, or produced in in-vitro biologic specimens collected from the patient.	Diagnostic results: Information about diagnostic results	**'Befunde und Abklärungen':** Diagnostic examinations (e.g. radiology, laboratory) including results, assessment results, observations, **vital signs**, assistive device clarifications, **living situation clarifications**, etc.
	(S) → 0..1 MS Observation Results (IPS) | DiagnosticReport (IPS)	0..1 MS CH eTOC Lab Observation | CH eTOC Pathology Observation | CH eTOC Radiology Observation | CH eTOC Cardiology Observation | CH eTOC Body Weight Observation | CH eTOC Body Height Observation	Optional
	LOINC 30954-2 Relevant diagnostic tests/laboratory data Narrative	LOINC 30954-2 Relevant diagnostic tests/laboratory data Narrative	-

Vital Signs	Notable vital signs or physical findings such as the most recent, maximum and/or minimum, baseline, or relevant trends may be included.	There is no vital sign section in CH eTOC. Some of the typical vital sign profiles (e.g. body weight, body height) are integrated in the diagnostic result section.	See section 'Befunde und Abklärungen'
	Optional → 0..1 Vital Signs Profiles (Observation)	-	-
	LOINC 8716-3 Vital signs	-	-
Past History of Illness	Description of the conditions the patient suffered in the past.	Medical history[37]: Past history of illness	**'Anamnese':** Patient history information, e.g. current condition, personal/family/**social**/ systemic **history**, **pregnancies**/births, **immunisation status**, environmental factors, medication adherence, potential/current drug problems.
	Optional → 0..1 Condition (IPS)	0..1 MS CH eTOC Past History of Illnesses Condition	Optional
	LOINC 11348-0 History of Past illness Narrative	LOINC 11348-0 History of past illness Narrative	-
Pregnancy	Summary of pregnancy status and history.	Pregnancy: Information about pregnancy	See section 'Anamnese'
	Optional → 0..1 Observation (Pregnancy: status) | Observation (Pregnancy: outcome)	0..1 MS CH eTOC Pregnancy Status Observation	-
	LOINC 10162-6 History of pregnancies Narrative	LOINC 10162-6 History of pregnancies Narrative	-
Social History	Health related 'lifestyle factors' or 'lifestyle observations' (e.g. smoking habits; alcohol consumption; diets, risky habits.)	Social history	See section 'Anamnese'

[37] https://github.com/hl7ch/ch-etoc/issues/48

	Optional → 0..1 Observation (SH: tobacco use) | Observation (SH: alcohol use)	0..1 MS CH eTOC Social History Condition	-
	LOINC 29762-2 Social history Narrative	LOINC 29762-2 Social history Narrative	-
Functional Status	Description of patient's capability to perform acts of daily living, including patient's possible need to be continuously assessed by third parties.	Functional status	See section 'Befunde und Abklärungen'
	Optional → 0..1 Condition (IPS) | Clinical Impression	0..1 MS CH eTOC Functional Status Condition	-
	LOINC 47420-5 Functional status assessment note	LOINC 47420-5 Functional status assessment note	-
Plan of Care	Description of the expectations for care including proposals, goals, and order requests for monitoring, tracking, or improving the condition of the patient.	Care plans: Information about care plans	**'Weitere Massnahmen und Empfehlungen':** Relevant information in the further treatment, including appointments, open findings, preventive examinations, devices (wheelchair, oxygen), therapy prescriptions, etc.
	Optional → 0..1 CarePlan	0..1 MS CH eTOC Careplan (Media)[38]	Optional
	LOINC 18776-5 Plan of care note	LOINC 18776-5 Plan of care note	-
Advance Directives	Description of patient's advance directives.	*See 'Patient Consent' in the 'Header' component*	**'Patientenverfügungen':** Information regarding existing advance directives.
	Optional → 0..1 Consent	-	Optional
	LOINC 42348-3 Advance directives	-	-
Order & Referral by Form	-	Order Referral: Contains the data that supports the order and	-

[38] https://github.com/hl7ch/ch-etoc/issues/49

		referral by form.	
	-	1..1 MS CH ORF Questionnaire | CH ORF QuestionnaireResponse | CH eTOC Service Request | CH ORF DocumentReference	-
	-	LOINC 93037-0 Portable medical order form	-
Original Represen-tation	-	Original representation: Contains the original representation as a pdf of the current document.	-
	-	0..1 MS Binary	-
	-	LOINC 55108-5 Clinical presentation	-
Purpose	-	Purpose[39]	**'Überweisungsgrund':** Reason for patient admission or referral
	-	0..1 MS CH eTOC ServiceRequest	Optional
	-	LOINC 42346-7 Medications on admission (narrative)	
Attachment	-	Attachment	**'Weitere Informationen':** Documents and information given to patients that are directly related to care, such as driving ability, ability to work, insurance information, coping strategies, etc.
	-	0..1 MS CH eTOC Attachment (Media)[40]	Optional
	-	LOINC 18776-5 Plan of care note	-

[39] https://github.com/hl7ch/ch-etoc/issues/51
[40] https://github.com/hl7ch/ch-etoc/issues/50

Course of Treatment	-	-	**‘Verlauf’:** Summary of information relevant to the course of treatment during the treatment phase
	-	-	Optional
Assessment	-	-	**‘Beurteilung’:** Interpretation of the current patient situation
	-	-	Optional
Warnings, Risks and Notes	-	-	**‘Warnungen, Risiken, Hinweise’:** Relevant information that could be significant in the treatment, such as risk of falls, malnutrition, infections, risk of pressure sores, interactions, drug adherence, etc.
	-	-	Optional (may be required in the future)
Patient preferences	-	-	**‘Präferenzen des Patienten’:** Personal preferences of the patient
	-	-	Optional

Table 6: Comparison of FHIR IPS and CH eTOC implementation guides

Comments

With the exception of the Advanced Directive section, CH eTOC contains all the sections found in the FHIR IPS. CH eTOC also adds sections from CH ORF and IPAG eTOC report sections, namely: Order & Referral by Form, Original Representation, Purpose, and Attachment. These are not part of FHIR IPS. Certain sections in the IPAG eTOC report are not represented in CH eTOC, and sections also differ in the granularity of the data they contain.

CH eTOC and FHIR IPS also differ with regards to optionalities of the sections, mustSupport and, in part, the LOINC codes that identify the sections. Exact differences can be found in the comparison table.

Another difference between FHIR IPS and CH eTOC is the specified profiles. In FHIR IPS, IPS-specific or FHIR core profiles are used. In CH eTOC, eTOC-specific profiles or CH Core profiles are used.

One new feature defined in FHIR IPS is the referencing of DocumentReference from each individual section. In CH eTOC it is possible to use DocumentReferences in the 'Attachment' section.

CH eTOC data elements have dual representation: one defined by the Questionnaire (CH eTOC form) and the second by the profile of CH eTOC on the resource (CH eTOC profile).

There are few commonalities at the section level. In summary, there are some sections that can be mapped to each other, but it should be noted that some of them still differ in content.

6.6 Medication Summary section

CH eTOC only uses the resource type MedicationStatement. FHIR IPS can use more resource types from the medication category as defined in the base FHIR standard.

The section is required in IPS but not in CH eTOC.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Medication Statement	IPS MedicationStatement (0..*) MS	M	medication.medicationStatement 0..*	CH EMED MedicationStatement (0..*)	
	medication (1..1) MS	R	(Parent element not explicitly listed)	medication (1..1)	Card. diff. form, no mustSupport
	medication.code (1..1) MS	-	(Parent element not explicitly listed)	medication.code (0..1)	Card. diff., no mustSupport
	medication.code.coding (0..*) MS VS: SCT/ ATC/ Absent-Unknown	O	-	medication.code.coding (0..*) GTIN	No mustSupport, diff. coding, no value for absent/unknown
	medication.code.text (0..1) MS	RK	medication.medicationstatement.medication (0..1)	medication.code.text (1..1) MS	Card. diff. profile
	medication.form (0..1) MS VS: EDQM Dose Form	R	-	medication.form (0..1) MS VS: EDQM Dose Form	Missing in form, IPS/Swiss specific VS
	medication.ingredient (0..*) MS	R	-	medication.ingredient (0..*) MS	Missing in form

	medication.ingredient .item (1..1) MS VS: SCT	R	-	medication.ingr edient.item (1..1) MS VS: SCT	Missing in form, IPS/Swiss specific VS
	medication.ingredient .strength (0..1) MS	R	-	medication.ingr edient.strength (0.1) MS	Missing in form
	effectiveDateTime/eff ectivePeriod (1..1) MS (incl. data-absent-reason)	R	-	dosage.timing.r epeat.boundsP eriod (0..1) MS	Missing in form, mapping in CH EMED to a diff. element with diff. card., no data-absent-reason
	reasonCode (0..*)	O	-	reasonCode (0..1)	Card. diff.
	dosage (0..*) MS	R	(parent element not explicitly listed)	dosage (1..*)	Card. diff, no mustSupport
	dosage.text (0..1) MS	O	medication.med icationstatemen t.dosage (0..1)	dosage.text (0..1)	No mustSupport
	dosage.timing (0..1) MS	R	-	dosage.timing (0..1)	Missing in form, no mustSupport
	dosage.route (0..1) VS: EDQM ROA	O	-	dosage.route (0..1) VS: EDQM ROA	IPS/Swiss specific VS
	dosage.doseAndRate (0..*)	R	-	dosage.doseAn dRate (0..1)	Card. diff.

Table 7: Comparison of FHIR IPS and CH eTOC MedicationSummary

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Comments

Not all elements required by IPS are represented in the CH eTOC form. There are differences in cardinalities and mustSupport between the IPS and the CH eTOC profiles.

Medication code is different in IPS and the CH EMED (GTIN). However, as the binding strength is preferred, the CH eTOC ValueSet can be different. For other elements, ValueSets are based on the same CodeSystem. ValueSets have not been compared in detail here.

6.7 Allergies and Intolerances section

The allergies and intolerances section is required in IPS but not in CH eTOC.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Allergy Intolerance	IPS AllergyIntolerance (1..*) MS	M	allergyIntolerance.status 0..1	CH eTOC AllergyIntolerance (0..*) MS (based on CH AllergyIntolerance)	Card. diff., the mapping between form and resource is not clear (open issue[41])
	abatement-dateTime extension (0..1)	C	-	abatement-dateTime extension (0..1) MS	Defined mustSupport
	clinicalStatus (0..1) VS: HL7	R	-	clinicalStatus (0..1) MS VS: HL7	Defined mustSupport
	verificationStatus (0..1) VS: HL7	O	-	verificationStatus (0..1) MS VS: HL7	Defined mustSupport
	type (0..1) MS VS: HL7	RK	-	type (0..1) MS VS: HL7	Missing in form
	criticality (0..1) VS: HL7	O	-	criticality (0..1) MS VS: HL7	Defined mustSupport
	code (0..1) MS	R	-	code (1..1) MS	Card. diff., missing in form
	code.coding (0..*) MS VS: SCT/ ATC/ AbsentUnknown	R	-	code.coding (0..*) VS: SCT	No mustSupport, only SCT VS (IPS/Swiss specific VS), no value for absent/unknown
	code.text (0..1) MS	R	-	code.text (0..1) MS	Missing in form
	onsetDateTime (0..1) MS	RK	-	onsetDateTime (0..1) MS	Missing in form

[41] https://github.com/hl7ch/ch-etoc/issues/57

	reaction (0..*) MS	RK	-	reaction (0..*) MS	Missing in form
	reaction.manifestation (1..*) MS VS: SCT	RK	-	reaction.manifestation (1..*) MS VS: SCT	Missing in form, IPS/Swiss specific VS
	reaction.onset (0..1)	not specified	-	reaction.onset (0..1) MS	Defined mustSupport
	reaction.severity (0..1) MS VS: HL7	RK	-	reaction.severity (0..1) MS VS: HL7	Missing in form

Table 8: Comparison of FHIR IPS and CH eTOC Allergy Intolerance

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Comments

The CH eTOC form allows for only one text entry for all allergy intolerances. FHIR IPS and CH eTOC allow for multiple entries.

Not all IPS-required elements are represented in the CH eTOC form. Differences exist in the IPS / CH eTOC profiles for both cardinalities and mustSupport.

The Must Support flags for the AllergyIntolerance resource have been set as in AllergyIntolerance IPS 1.0.0 as part of the IPAG recommendations. Besides that reaction.substance and category have been flagged because these fields play an important role in the mentioned recommendations.[42]

IPS AllergyIntolerance.code ValueSets are different to CH AllgeryIntolerance. However, as the binding strength is preferred, the CH eTOC AllergyIntolerance ValueSet can be different. For other elements, ValueSets are based on the same CodeSystem. ValueSets have not been compared in detail here.

[42] http://fhir.ch/ig/ch-allergyintolerance/index.html#must-support

6.8 Problem List section

The section is required in IPS but not required in CH eTOC.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Condition	IPS Condition (1..*) MS	M	diagnosisList.primaryDiagnosis.item/ diagnosisList.secondaryDiagnosis.item 0..*	CH eTOC Primary Diagnosis Condition/ CH eTOC Secondary Diagnosis Condition (0..*) MS	Card. diff.
	clinicalStatus (1..1) MS VS: HL7	O	-	clinicalStatus (0..1) VS: HL7	Card. diff., no mustSupport, missing in form
	verificationStatus (0..1) VS: HL7	NA	-	verificationStatus (0..1) VS: HL7	-
	category (0..*) MS VS: IPS VS (HL7)	RK	(depends on item primaryDiagnosis vs. secondaryDiagnosis)	category (1..1) MS VS: eTOC VS (primary-diagnosis/ secondary-diagnosis)	Card. diff., different VS
	severity (0..1) MS VS: HL7 (additional IPS VS (LOINC))	RK	-	severity (0..1) VS: HL7	No mustSupport, missing in form, only HL7 VS
	code (1..1) MS	RK	-	code (1..1) MS	-
	code.coding (0..*) MS VS: SCT/ AbsentUnknown	-	-	code.coding (0..*) VS: HL7	No mustSupport, missing in form, different VS (IPS specific VS), no value for absent/unknown

	code.text (0..1) MS	-	diagnosisList.primaryDiagnosis.item/ diagnosisList.secondaryDiagnosis.item	code.text (1..1) MS	Card. diff.
	bodySite (0..*) VS: HL7	NA	-	bodySite (0..*) VS: HL7	-
	encounter (0..1)	O	-	encounter (0..1)	-
	onsetDateTime (0..1) MS	RK	-	onset[x] (0..1)	Data type not defined, no mustSupport, missing in form
	abatement (0..1)	NA	-	abatement (0..1)	-
	asserter (0..1)	NA	-	asserter (0..1)	-

Table 9: Comparison of FHIR IPS and CH eTOC Problem Lists

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Comments

CH eTOC form defines a primary and secondary diagnosis, while the FHIR IPS and CH eTOC allows for multiple conditions.

Not all IPS ‘mustSupport’ elements are represented in the CH eTOC form, with differences in cardinalities and ‘mustSupport’ between the IPS and the CH eTOC profiles.

ValueSet are different between IPS and CH eTOC. However, as the binding strength is preferred, the CH eTOC ValueSet can be different.

6.9 Immunisation section

This section is present in both FHIR IPS and CH eTOC.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Immunis-ation	IPS Immunisation (1..*) MS	R	immunisation.status 0..1	CH eTOC Immunisation (0..*) MS (based on CH VACD Immunisation)	Card. diff.
	status (1..1) MS VS: HL7	NA	-	status (1..1) MS VS: HL7	Missing in form
	vaccineCode (1..1) MS	R	-	vaccineCode (1..1) MS	-
	vaccineCode.coding (0..*) MS VS: SCT/ ATC/ AbsentUnknown	-	-	vaccineCode.coding (0..*) VS: Swissmedic/ SCT/ AbsentUnknown	No mustSupport, missing in form, additional Swissmedic VS, SCT: IPS/Swiss specific VS
	vaccineCode.text (0..1) MS	-	immunisation.status 0..1	vaccineCode.text (0..1) MS	-
	occurrence[x] (1..1) MS (incl. data-absent-reason)	R	-	occurenceDateTime (1..1) MS	only data type dateTime, missing in form, no data-absent-reason
	lotNumber (0..1)	O/RK	-	lotNumber (0..1) MS	Defined mustSupport, missing in form
	site (0..1) VS: HL7 (SCT)	NA	-	site (0..1) MS VS: HL7 (ActSite)	Defined mustSupport, missing in form, different VS
	route (0..1) VS: EDQM ROA	O	-	route (0..1) MS VS: CH VACD (EDQM)	Defined mustSupport, missing in form, different VS

	performer (0..*)	O	-	performer (0..*) → .actor MS	Defined mustSupport, missing in form,
	protocolApplied.targetDisease (0..*) VS: SCT	O/R	-	protocolApplied.targetDisease (1..*) MS VS: SCT	Card. diff. defined mustSupport, missing in form, IPS/Swiss specific VS

Table 10: Comparison of FHIR IPS and CH eTOC Immunisation

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Comments

The CH eTOC form allows only one text entry for all immunisations, while FHIR IPS and CH eTOC allow for multiple entries.

IPS ValueSets are different from those of CH VACD. However, as the binding strength is preferred, the CH eTOC ValueSet can be different. For other elements, ValueSets are based on the same CodeSystem. ValueSets have not been compared in detail here.

6.10 History of Procedures

This section is present in both FHIR IPS and CH eTOC.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Procedure	IPS Procedure (1..*) MS	R	anamnesis.historyofprocedures 0..1	CH eTOC Procedure (0..*) MS	Card. diff.
	status (1..1)	-	-	status (1..1) MS	Defined mustSupport, missing in form
	code (1..1) MS	R	-	code (0..1) MS	Card. diff., missing in form
	code.coding (0..*) MS VS: SCT/ AbsentUnknown	-	-	code.coding (0..*) VS: SCT	No mustSupport, missing in form, different VS (SCT: IPS specific), no value for absent/unknown
	code.text (0..1) MS	RK	anamnesis.historyofprocedures	code.text (0..1) MS	-

	performed[x] (1..1) MS (incl. data-absent-reason)	R	-	performed[x] (0..1)	Card. diff., no mustSupport, missing in form
	bodySite (0..*) VS: HL7 (SCT)	O	-	bodySite (0..*) VS: HL7 (SCT)	-

Table 11: Comparison of FHIR IPS and CH eTOC History of Procedures

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Not all IPS-required elements are represented in the CH eTOC form, and there are differences in cardinalities and mustSupport between the IPS and the CH eTOC profiles.

IPS ValueSets are different from those of CH eTOC. However, as the binding strength is preferred, the CH eTOC ValueSet can be different.

Comments

6.11 Medical Devices

The resource DeviceUseStatement is used in the FHIR IPS section and the Device is referenced from it. In CH eTOC, the Device resource is directly referenced from the section.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
DeviceUse Statement	IPS DeviceUseStatement (1..*) MS	R	anamnesis.device 0..1	CH eTOC Device (0..*) MS	Card. diff.
	timing[x] (1..1) MS (incl. data-absent-reason)	R/O	-	No DeviceUseStatement	Diff. resources, no mustSupport
	source (0..1)	-	-	No DeviceUseStatement	Diff. resources
	device (1..1) MS	R	-	Referenced from section.entry	Diff. resources
	device.type (0..1) MS VS: SCT/ AbsentUnknown	R	-	deviceName (0..*) MS - name (1..1) MS - type (1..1) MS	Mapping in CH eTOC to a diff. element, no VS, no data-absent-reason

	device.udiCarrier.deviceIdentifier (0..*)	RK	-	device.udiCarrier.deviceIdentifier (0..*)	-
	bodySite (0..1) VS: HL7 (SCT)	-	-	No DeviceUseStatement	Diff. resources

Table 12: Comparison of FHIR IPS and CH eTOC Device Use Statement

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Not all IPS-required elements are represented in the CH eTOC form, and there are differences in cardinalities and mustSupport between the IPS and the CH eTOC profiles.

IPS ValueSets are different from those of CH eTOC. However, as the binding strength is preferred, the CH eTOC ValueSet can be different.

Comments

6.12 Diagnostic Results

FHIR IPS references in this section profiles Observation Results and DiagnosticReport. CH eTOC references four different Observation profiles, Lab, Pathology, Radiology, Cardiology, in addition to Observation profiles for body weight and height. Weight and height are in the 'vital signs' section in FHIR IPS.

Because of the wider content of the CH eTOC (see next point), a greater number of resources are used here.

IPS Profile	FHIR IPS	IPS	CH eTOC Form	CH eTOC Profile	Comment
Observation	IPS Observation Results (0..*) MS	R	lab.result 0..* pathology.result 0..1 imaging.result 0..1 cardiology.result 0..1	Various Observations (0..*) MS	The mapping between form and resource is not clear (open issue[43])
	status 1..1 VS: HL7	NA	-	status (1..1) MS VS: HL7	Missing in form
	category 0..* VS: HL7	NA	-	category 0..* VS: HL7	-
	code/component.code	R/RK	-	code (1..1) Fixed LOINC	No mustSupport, only these specific

[43] https://github.com/hl7ch/ch-etoc/issues/59

	(1..1) MS VS: HL7 (LOINC)			codes for the various profiles	defined observations possible
	effective[x] (1..1) MS (incl. data-absent-reason)	R	-	effective[x] (0..1)	Card. diff., no mustSupport, missing in form
	performer (0..*)	O	-	performer (0..*)	-
	value[x]/component.value[x] (0..1) MS	C	-	value[x] (0..1)	No MustSupport, missing in form
	hasMember (0..*)	NA	-	hasMember (0..*)	-

Table 13: Comparison of FHIR IPS and CH eTOC Diagnostic Rules

Legend: M = Mandatory; R = Required; RK = Required if Known; C = Conditional; O = Optional

Not all IPS required elements are represented in the CH eTOC form, and there are differences in cardinalities and mustSupport between the IPS and the CH eTOC profiles. The CH eTOC form limits elements to free text entries for lab, pathology, imaging and cardiology. Mapping between form and resource is not clear.	Comments

6.13 Optional sections

There is no ‘vital signs’ section in CH eTOC. Instead two observations of typical vital sign profiles (body weight and body height) are integrated in the diagnostic result section and supported in the form (see above). FHIR IPS supports more vital signs profiles than CH eTOC.	Vital Signs section
In the CH eTOC form, a text field exists to map the history of disease. In the CH eTOC profile, however, it is possible to use several conditions resources for this purpose. Additional guidance is needed in CH eTOC how to map from the form to the structured data and back. The ‘mustSupport’ elements defined in the FHIR IPS profile are not supported by either the CH eTOC form or the CH eTOC profile. In addition, different ValueSets are used in the two formats.	Past History of Illness section
The FHIR IPS distinguishes between status and outcome for observations, the CH eTOC uses only status. The profile ‘Observation – Pregnancy: Status’ in CH eTOC specifies the quantity data type for the value[x] element, whereas CodeableConcept is	Pregnancy section

used in FHIR IPS and a ValueSet that allows status to be mapped is specified. In FHIR IPS, the expected delivery date is mapped via another referenced observation (hasMember). This reference is missing in CH eTOC, although this value is requested in the form.	
The FHIR IPS us‘s 'Observations’ whereas the CH eTOC uses ’Conditions’. In FHIR IPS, more than one entry can be specified. In CH eTOC, only one entry is allowed in the form and in the profile.	Social History section
The FHIR IPS defines both ‘Condition’ and ‘ClinicalImpression’ here, whereas the CH eTOC only defines ‘Condition’. In the CH eTOC form, there is a text field to map functional status. In the CH eTOC profile, however, it is possible to use several condition resources for this purpose. There is a discrepancy here. The ‘mustSupport’ elements defined in the FHIR IPS profile are not supported by either the CH eTOC form or the CH eTOC profile. In addition, different ValueSets are used in the two formats.	Functional Status section
FHIR IPS uses the ‘CarePlan’ resource for this entry. CH eTOC uses the ‘Media’ resource, but the title is ‘CH eTOC Careplan’ (there is an open issue about it[44]). However, the mapping in the form points to t‘e 'Media’ resource. The CH eTOC profile does not define any elements in the differential, so the current state is difficult to evaluate.	Plan of Care section
The content of advance directives is in different parts of the document. In CH eTOC, this content is defined in t‘e 'Patient Cons’nt' in t‘e 'Hea’er' component. There is no section defined.	Advance Directives section

[44] https://github.com/hl7ch/ch-etoc/issues/49

7 What should be updated in CH eTOC to implement IPS?

7.1 Context

Alignment of Swiss exchange formats with IPS

As the analysis has shown, CH eTOC is based on the IPS library but does not support the IPS main use case scenario of unplanned care. Some incompatibilities exist. These are mainly due to different requirements for free text and structured data, as well as continuing development activity and the lack of alignment between the base Swiss profiles and the IPS. Where possible, these incompatibilities should be addressed in a future release.

CH eTOC is based on other exchange formats such as CH EMED, CH VACD and CH AllergyIntolerance. Alignment should be performed not only on CH eTOC, but directly on the base exchange formats themselves. Since these exchange formats are using each other base profiles (e.g CH VACD uses the Medication profile from CH EMED) these base resource profiles should be defined in CH Core.

In addition, CH eTOC adds further requirements with a form and service request. Any system conforming solely to CH eTOC would not be able to work with an IPS provided from another country.

Therefore, we recommend a three-phase approach to updating CH eTOC:

1. Bring the IPS requirements to CH Core and align the Swiss profiles to conform with IPS.
2. Create a Swiss IPS implementation guide (CH IPS) as an exchange format.
3. Further align CH eTOC to conform with IPS in a future version.

7.2 Incorporate the IPS requirements into CH Core

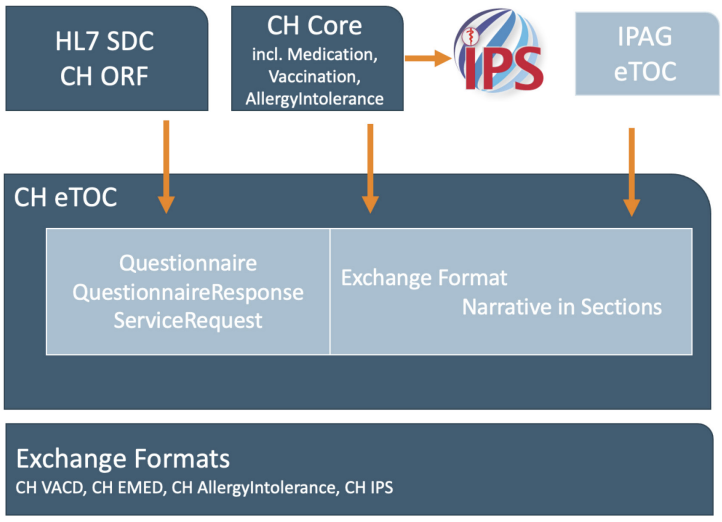

Figure 5: Base Swiss reusable profiles on IPS

1. Swiss profiles on resources that should be reusable within Switzerland should not be defined in derived implementation guides such as CH EMED, CH VACD, CH AllergyIntolerance, CH ORF, and CH eTOC. Reusable resources such as MedicationStatement or Immunization should be defined directly in CH Core. These profiles should be transferred into CH Core. Conformity with IPS profiles should be specified in CH Core if possible. Where there is a difference, the reasons should be indicated. This would guarantee that the base resources used in Switzerland conform with IPS.
2. CH Core resources should declare which IPS profiles they are compliant with (see discussion on Zulip[45]).
3. Derived implementation guides for CH VACD, CH EMED, CH AllergyIntolerance, CH ORF and CH eTOC etc. would then add additional profiles on resources and constraints necessary specifically for those implementation guides.
4. A CH IPS implementation guide should be created for the IPS exchange format. Examples could be added and validated.

Propagating a CH IPS implementation guide would also make it clear that this is the implementation of the primary IPS use case scenario of unplanned cross-border care. Another advantage is that IPS testing could then be offered at the Projectathon.

7.3 Align CH eTOC to IPS to support for planned and unplanned care

Discrepancy between the form/questionnaire and exchange format

There is a discrepancy between the CH eTOC form/questionnaire and the structured data. The form covers less data elements then the CH eTOC profiles and the IPS data elements. This difference needs to be addressed: either the form is enhanced or structured resources are directly referenced via pre-population.

For medication, allergy intolerances and immunisations, the current form does not ask for sufficient information or uses one text field for multiple entries. It cannot therefore provide enough data to generate valid FHIR IPS and Swiss exchange formats. According to the author this is a compromise for acceptance and was explicitly wished. It was not a goal to provide a valid IPS, the goal was to follow the content of the IPS.

We propose however that CH eTOC is further aligned to IPS in the following areas:

[45] https://chat.fhir.org/#narrow/stream/179177-conformance/topic/Profile.20assertion.20of.20consistency

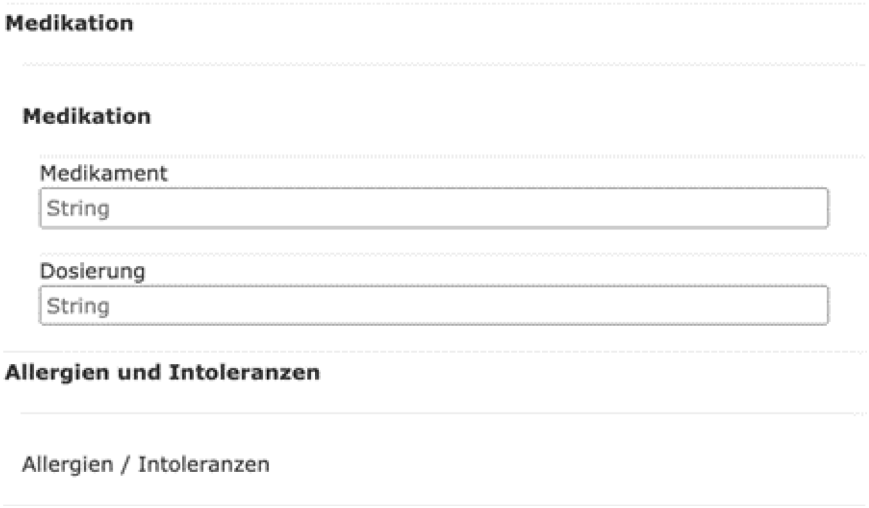

Figure 6: CH eTOC form[46]

Align to CH eTOC to FHIR IPS

- Update CH eTOC with new published STU1.1 version of IPS and incorporate the changes from the version 1.1 (reduction of must support, additional narrative guidance, guidance about Representing “known absent” and “not known” etc).
- Align the data elements with ‘mustSupport’ requirements from FHIR IPS / IPS data elements as indicated in the analysis.
- Use the same section coding in CH eTOC and in FHIR IPS for medication summary and problem list. Examples of CH eTOC bundles should be provided in the implementation guide with structured data (e.g. MedicationStatement), as the existing example does not have that information[47].
- Include ‘known absent’ and ‘not known’ concepts for required sections, either in the Questionnaire or as a restriction in the exchange format and as an obligation for implementers.
- Require the narrative text for the sections to be populated and outline this requirement in the implementation guide text.
- There is a “vital signs” section in the FHIR IPS IG. FHIR defines body weight and body height as “vital signs”. Reconsider if the CH eTOC entries for body weight and body height should be referenced in the ‘vital signs’ sections or if listing them in diagnostic section would be a valid approach.
- It would be helpful to have a description in CH eTOC of the relationship with FHIR IPS, the commonalities and the incompatibilities.

[46] https://build.fhir.org/ig/hl7ch/ch-etoc/branches/main/questionnaire-form.html
[47] https://build.fhir.org/ig/hl7ch/ch-etoc/branches/main/Bundle-DocumentEtoc.html

'mustSupport' definition

If an IPS-conforming document is the goal, add a definition of 'mustSupport' to CH eTOC as per the IPS approach. As eTOC is building up its IPS library, this is not a strict requirement, if the flexibility needs to be greater.

8 Conclusion

Conclusion

Purpose for this report is to address eHealth Suisse's questions about CH eTOC and IPS, their commonalities and the potential to have CH eTOC corresponding to a Swiss implementation of the IPS, or if the two exchange formats are incompatible for being merged.

In detail

In detail, the request for proposal asked the following specific questions, which are commented in this report.

- How can the IPS be implemented in the Swiss EPR?

  The report highlights that effective IPS implementation requires choices on the technical aspects (see chapters 3.2 to 3.4 as possibilities), and possibly some additions in the Swiss regulatory framework.

- IPS as a structured exchange format for the Swiss EPR

  The report describes the building blocks for the IPS. They require technical choices to guide user's developments and implementations.

- What are the commonalities between IPS and CH eTOC, by considering existing documentations such as IPS implementation guide (HL7 FHIR), CH eTOC implementation guide, IPAG report on transition of care (eÜberweisungsbericht)?

  The report describes commonalities and differences between CH eTOC and IPS (as well IPAG work), which illustrate some implementation challenges.

- What should be updated in the CH eTOC to implement IPS

  considering existing documentations such as IPS implementation guide (HL7 FHIR), CH eTOC implementation guide, IPAG report on transition of care (eÜberweisungsbericht)?

Regulatory framework

As mentioned earlier, the Swiss regulatory framework is not mandating (or guiding) IPS implementation. CH eTOC might be fitting in the Swiss regulatory framework and has been conceived in that respect. This does not correspond to the IPS requirements -for instance requiring much more coded information instead of "free text" allowance. That may be noticed for problem list for patients, i.e., there is large variability on how this is done. The level of granularity differs, and any type of coding is less frequent.

Work load

Beside the regulatory framework, the consultation has revealed that particular attention should be drawn to clinician's workload: that means that it should be possible (even, required) that IPS generation is processed from existing structured data in the primary systems, with

minimal human intervention.

We conclude that both CH eTOC and IPS shall be leveraging the same building blocks but -since they correspond to potential different use cases- should both be implemented as specific exchange formats. We thus state that Conformity with IPS profiles should be already specified in CH Core, as far as possible

Appendix 1: IPS in relation to IPA

Context

If plans for a central repository for dynamic data is to be realised, we must define the API to this dynamic data. The International Patient Access (IPA) standard[48], which is in development by HL7, aims to enable regulators, empower patients, and guide app developers. It promises greater consistency across countries for multinational apps and FHIR servers, and so could be a potential candidate since it provides for a universal API for health data. This will allow medical apps and/or consumer devices to work directly on structured data as defined by IPA content profiles.

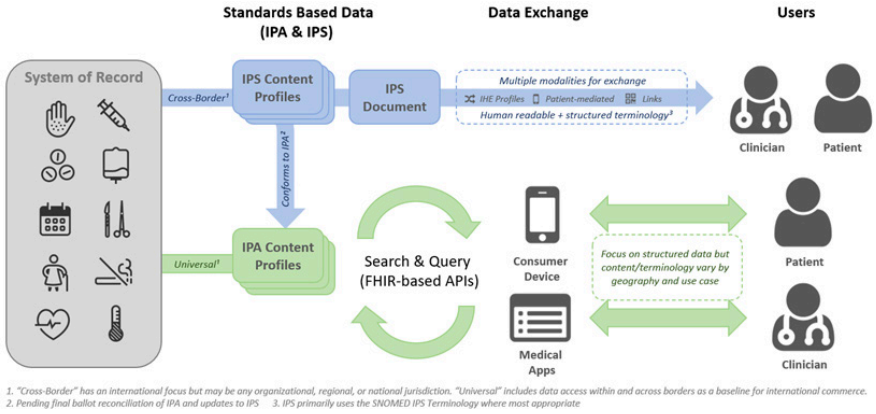

Figure 7: IPA vs. IPS comparison of data exchange

Because IPS content profiles should conform to IPA profiles, it makes sense to recommend that national exchange formats are compatible with IPS. IPA and IPS initiatives could then be adapted and used within the Swiss EPR.

[48] https://blog.hl7.org/international-patient-access

Appendix 2: Glossary

The International Patient Summary is a minimal and non-exhaustive set of basic clinical data for a patient. It is specialty-agnostic and condition-independent, but readily usable by all clinicians for unscheduled (cross-border) patient care[49].	IPS
Swiss Federal Electronic Patient Record	Swiss EPR
Exchange formats define the syntax and semantics to be used for structured documents and are intended to be used for directional and non-directional communication. For example, a referral document sent by a doctor to the hospital may be made available for the patient to upload to his or her EPR)[50].	Exchange formats
Patient	Subject of care
EPRO-FDHA – in German: Verordnung des EDI über das elektronische Patientendossier (SR 816.111)	EPRO-FDHA

[49] Source: https://international-patient-summary.net/
[50] Source: https://www.e-health-suisse.ch/fileadmin/user_upload/Dokumente/E/Exchange-format-handbook_part-1_v12.pdf