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Division of Chronic and Post-Acute Care

Post-Acute Care Interoperability Landscape Analysis Report

Final

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Executive Summary

This Post-Acute Care (PAC) Interoperability Landscape Analysis report reviews PAC providers' organizational and technical infrastructure and their capacity for supporting interoperability. This report is completed at the request of the Division of Chronic and Post-Acute Care (DCPAC).

To gain insights into the state of the current PAC interoperability landscape, the MITRE team conducted 19 discussions between November 2018 and January 2019. The discussion group included twelve PAC vendors, three PAC providers, and four PAC provider membership organizations, including one Health Information Exchange (HIE). The team also reviewed documents¹ provided by participants, external reports, articles, and presentations relevant to the landscape analysis.

Discussion Themes

Participants provided insights into their organizations' current capacity for interoperable data exchange and future plans to improve interoperability; discussed several interoperability use cases and challenges; and commented on Centers for Medicare & Medicaid Services (CMS) policies, assessments, and roles.

Current Capacity for Interoperable Data Exchange and Future Plans to Improve Interoperability

- **All vendors and all but one provider have an interoperability roadmap they are pursuing.**
- **Certification is inconsistent across PAC vendors, but some PAC providers did certify to the ONC 2014 Ed.** Some vendors don't certify unless required by customers. Certification does not make sense for some PAC providers since certain certification categories do not apply.
- **All but two participants are aware of CMS Administrator Seema Verma's comments on interoperability.**
- **All participants are aware of Fast Healthcare Interoperability Resources (FHIR) and most are developing or experimenting with FHIR Application Programming Interfaces (API).**
- **All vendors and all except two providers actively connect with HIEs.**

Interoperability Use Cases

Participants mentioned several PAC interoperability use cases, as shown in Figure ES-1.

¹ The documents were excluded from the report to maintain the participants' anonymity.

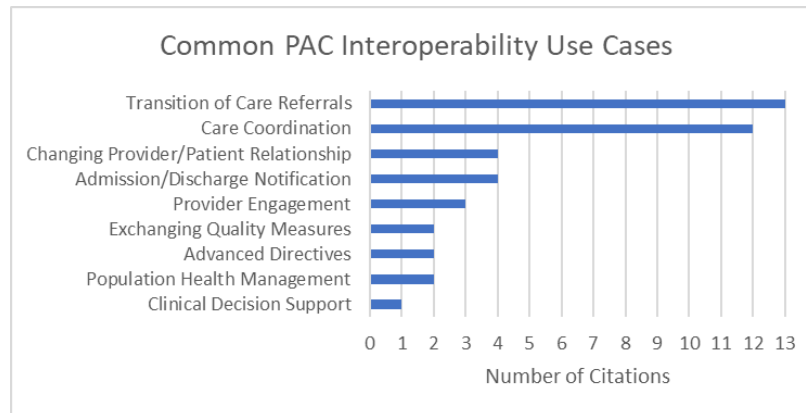


Figure ES-1: Commonly Cited PAC Interoperability Use Cases

Interoperability Challenges

Participants raised several challenges to achieving interoperability across PAC facilities and the rest of the healthcare system. These challenges are shown in Figure ES-2.

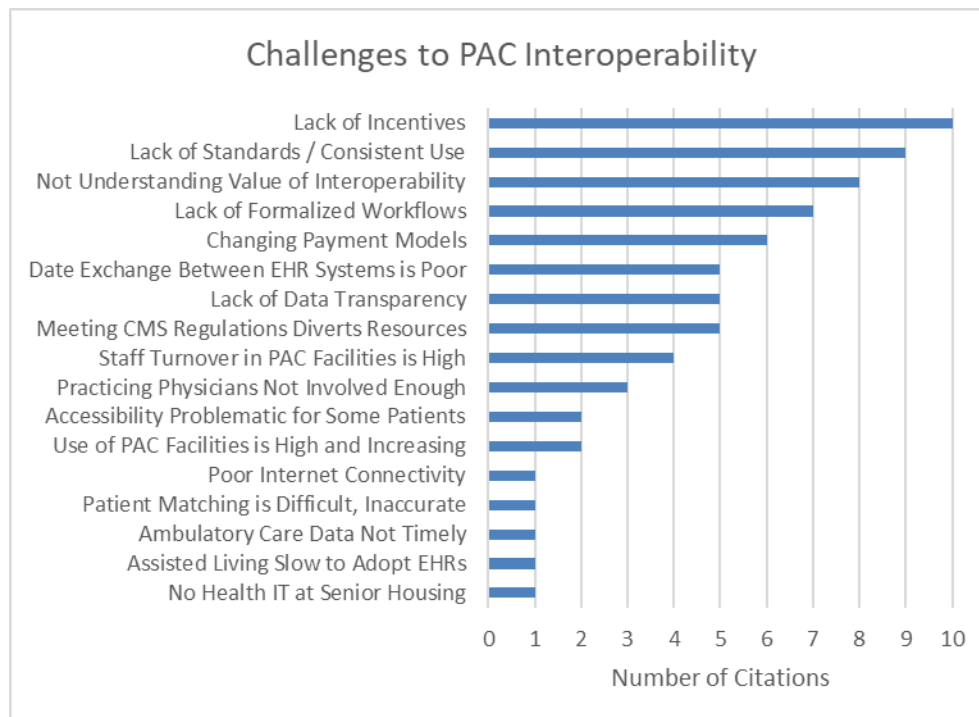


Figure ES-2: Commonly Cited Challenges to PAC Interoperability

Comments on CMS Policies, Assessments, and Roles

All vendors track and follow CMS policies and all except one incorporate CMS assessments into their products. All participants are aware of the CMS Data Element Library (DEL); four use it, and two promote its use. One member described using DEL information to develop internal quality measures. Others are waiting to see how the DEL develops, but appreciate that CMS is standardizing assessments. Some found the DEL difficult to navigate and asked why it was

created as a separate registry. Detailed information about DEL use may require additional stakeholder engagement.

Participants made several recommendations about the roles CMS should play to foster interoperability. The results from those discussions are shown in Figure ES-3.

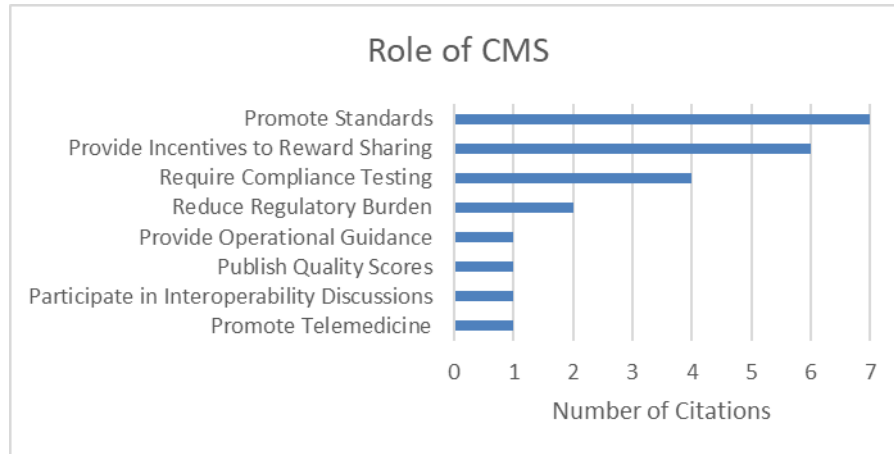


Figure ES-3: Commonly Cited Roles for CMS

Recommendations / Next Steps

All of the participants in the landscape analysis have developed organizational roadmaps to achieve greater interoperability and almost all are including FHIR development within their roadmaps. In order to leverage the momentum building in the PAC community around interoperability, FHIR, and address many of the critical challenges to achieving interoperability, the MITRE team recommends the following next steps:

- 1) Continue to engage with the Office of the National Coordinator (ONC) and other components within CMS to ensure that PAC is included in broader interoperability efforts
- 2) Consider transitioning the DEL codes into the Value Set Authority Center (VSAC)
- 3) Collaborate with CMS Quality Payment Program (QPP) to harmonize with Electronic Clinical Quality Improvement (eCQI) Resource Center
- 4) Establish a PAC Interoperability Working Group to support industry interoperability activities including:
 - Create sustainable governance and branding for the PAC Interoperability Working Group
 - Participate in the appropriate Health Level Seven International (HL7) working group(s)
 - Identify an agile, tightly-scoped use case to implement for a connectathon
 - Develop FHIR Implementation Guides for use case data models
 - Review and harmonize FHIR Implementation Guides with key stakeholders.
 - Host / participate in a connectathon to test FHIR Implementation Guides
 - Build industry consensus around FHIR Implementation Guides
 - Identify next agile part of use case to implement and repeat
- 5) Streamline and Harmonize Regulatory Requirements to the Greatest Extent Feasible
- 6) Add FHIR API to iQIES system

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1. Introduction

The Division of Chronic and Post-Acute Care (DCPAC) at the Centers for Medicare & Medicaid Services (CMS) asked MITRE to provide to provide strategic support for achieving data standardization for the alignment of the Post-Acute Care (PAC) Quality Reporting Programs (QRP) and across the healthcare system.

Part of this work involves conducting a landscape analysis of the organizational and technical infrastructure and reporting on the results of that study.

1.1 Scope

This report describes the PAC interoperability landscape analysis, provides an independent review of the conducted discussions, summarizes high-level themes from those discussions, and recommends next steps for CMS based on the themes.

1.2 Audience

The audience for this report is senior CMS leadership. Several discussion participants in the landscape analysis have requested that the report be shared with other PAC stakeholders.

1.3 Document Organization

Organization of this document is shown in Table 1 below:

Table 1. Document Organization

Section	Purpose
Section 2: Method	Description of how the landscape analysis was conducted
Section 3: Themes	List of themes and explanations reached during the landscape analysis
Section 4: Recommendations	Discussion of recommendations for next steps
Appendix A: Background	Description of previous activities around interoperability and why the landscape analysis was necessary
Appendix B: Discussion Topics	List of discussion topics covered in each landscape analysis discussion
Appendix C: Discussion List	List of organizations and individuals who participated in discussions as part of the landscape analysis
Appendix D: List of DEL TAG Participants	List of organizations and individuals who participated in the DEL TAG
Acronyms	Defines the acronyms used in this document

1.4 Assumptions

Readers of this report should have a basic understanding of PAC, the types of facilities included, and the types of interactions that can occur between those providers.

2. Method

The interoperability landscape analysis included several steps: (1) identification and selection of participants to outreach for discussions; (2) formulating topics for discussion; (3) scheduling and conducting the discussions; (4) reviewing any documents provided by discussion participants; (5) reviewing and analyzing the discussion themes; and (6) determining recommendations and next steps.

2.1 Participant Selection

The MITRE team identified potential participants based on verbal or written interest expressed during prior Fast Healthcare Interoperability Resources (FHIR) or interoperability efforts with CMS or the Office of the National Coordinator (ONC). The team targeted participants to include diverse representation from across the healthcare ecosystem, including electronic health record (EHR) vendors for both acute and post-acute settings, trade organizations representing PAC providers, and clinicians. Once a list of potential participants was finalized, CMS approved the list and the team sent an email to invite participation in an anonymous discussion with MITRE on behalf of CMS regarding the interoperability landscape.

2.2 Planning

The MITRE team customized discussion topics based on whether the participant represented a vendor or a healthcare provider. The team created a list of discussion topics that CMS reviewed.

Discussion topics for all participants included:

- Common use cases for interoperability in PAC
- Challenges and barriers to interoperability
- Impact of CMS policies on interoperability
- Role CMS should play with respect to facilitating interoperability
- Desired outcomes achieved through interoperability
- Aspirations for future interoperability efforts

For vendors, discussion topics also included:

- Information about products offered
- Description of primary customer base
- Feedback received from customers
- Use of mobile applications
- Technology architecture used by their products
- Product roadmap
- Certification of products
- Usage of Consolidated Clinical Document Architecture (C-CDA) and FHIR
- Connections to Health Information Exchanges (HIE)

For providers, discussion topics also included:

- Patient population characteristics
- Usage of EHR systems
- Organizational interoperability roadmap

2.3 Conducting Discussions

The MITRE team scheduled discussions for one-hour time periods; an additional 30 minute session was scheduled if the participant required more time to finish the discussion. Two MITRE staff were present for every call, with one facilitator and one note-taker to document the discussion. The team conducted discussions from November 2018 to January 2019 (see Appendix C. for a detailed list of discussion participants).

The first part of the discussion included a brief introduction to MITRE and its role as a Federally Funded Research and Development Center (FFRDC), the purpose of the landscape analysis, and the goals for the discussion. The team informed participants that responses would be anonymous unless they specifically wanted to be quoted, and that they had the option to decline any discussion topic. The second part of the discussion focused on the discussion topics identified in section 2.2 above as appropriate based on the participant's role as a representative of a vendor or provider.

2.4 Review of Supplemental Documents

Some participants provided supplementary documents and information relevant to the discussion. The MITRE team reviewed this material and included relevant information as additional background for this report.

2.5 Reviewing and Analyzing Discussions

The MITRE team reviewed all discussions both quantitatively and qualitatively. Where feasible, the team segmented questions into response categories of Yes/No/Maybe, and comments, then tallied by category per question. The team analyzed free form, descriptive responses for a number of factors and documented common themes, frequency of responses (where the same idea repeated), and any unique insights offered by participants. The team then summarized the themes for each question. Finally, the team aggregated summaries at a higher level to provide an overview of the individual discussions.

The team reviewed preliminary themes with the DEL Technical Advisory Group (TAG) Roundtable Meeting held on November 28, 2018. The DEL TAG brought together a group of 16 experts from industry and government to: (1) discuss impediments to interoperability, specifically in PAC settings; (2) identify use case opportunities for collaboration between PAC settings and more broadly across the healthcare system; and (3) solicit feedback on how the DEL might be leveraged to facilitate efforts to improve interoperability. See Appendix D for list of organizations that participated in the DEL TAG.

2.6 Recommendation Development

The MITRE team identified recommendations for next steps based upon the most common patterns from the conducted discussions, comments from PAC experts during the DEL TAG Roundtable Meeting, and best practices observed in other healthcare interoperability efforts, including Health Level Seven International (HL7), Argonauts, Substitutable Medical Applications, Reusable Technologies (SMART) on FHIR, ONC, CMS, and MITRE.

2.7 Limitations

Activities to inform the content of this landscape analysis report were conducted from October 2018 to January 2019 to provide a quick assessment of the current PAC landscape. The short timeframe limited the number of discussions possible. As a result, some use cases, challenges, and other themes of the PAC landscape may not be fully captured in this report. Participant diversity and integration of PAC expert feedback from the DEL TAG Roundtable Meeting on November 28, 2018 helped to mitigate these limitations.

Additionally, vendors typically respond to technical questions through the lens of their individual products. However, vendors supply the resources providers need to effectively interface with patients and understand the inherent challenges associated with developing systems that meet security requirements while minimizing duplicative data entry. Conducting discussions with a variety of both vendors and providers helps balance the perspective.

3. Themes

This section documents the themes that arose in discussions with participants as part of the interoperability landscape analysis. The themes from discussions with vendors are listed first, followed by the themes from discussions with providers.

3.1 PAC IT Vendors

Eleven PAC information technology (IT) vendors and organizations that represent a collaborative of vendors participated in the interoperability landscape analysis discussions and provided their perspective of current status of interoperability in the PAC market.

3.1.1 Customer Types

The vendors that participated in the landscape analysis serve a wide variety of PAC customers, as shown in Figure 1. A citation is defined as each participant serving a specific care setting. One vendor supplied products to patient caregivers, either a family member or a caregiver hired by the family to provide care to a patient, which has been defined as “families” in Figure 1.

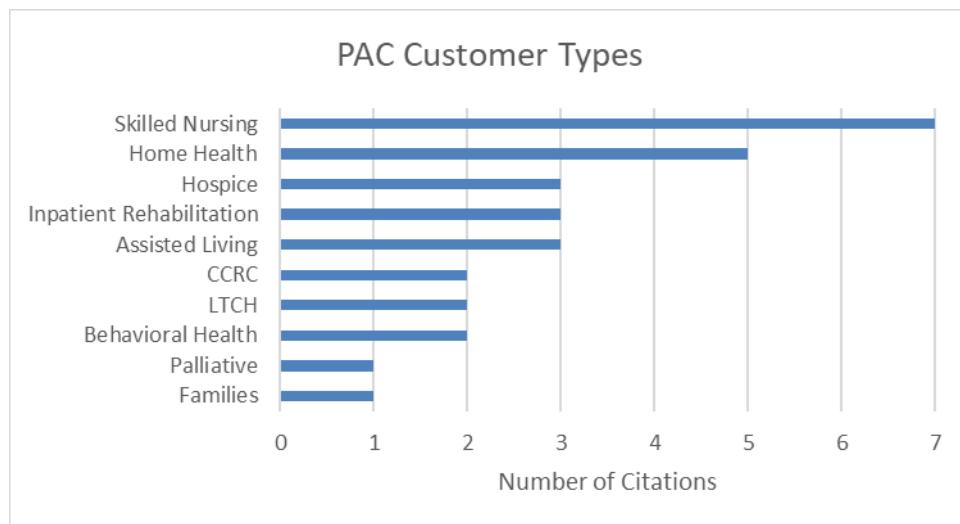


Figure 1: Primary Customers

3.1.2 Product Feedback

Some vendors were hesitant to provide specific feedback about their customers, but many shared some information with the team. Figure 2 displays the categorized results of that feedback. Nine out of eleven vendors indicated that they have received feedback from customers about their priorities for improved interoperability.



Figure 2: Top Customer Requests for Vendors

3.1.3 Use Cases

Customers use vendor software for a variety of purposes to help manage PAC patients as they navigate through the healthcare system. Vendors mentioned several interoperability use cases vendors during the landscape analysis discussions, as shown in Figure 3.

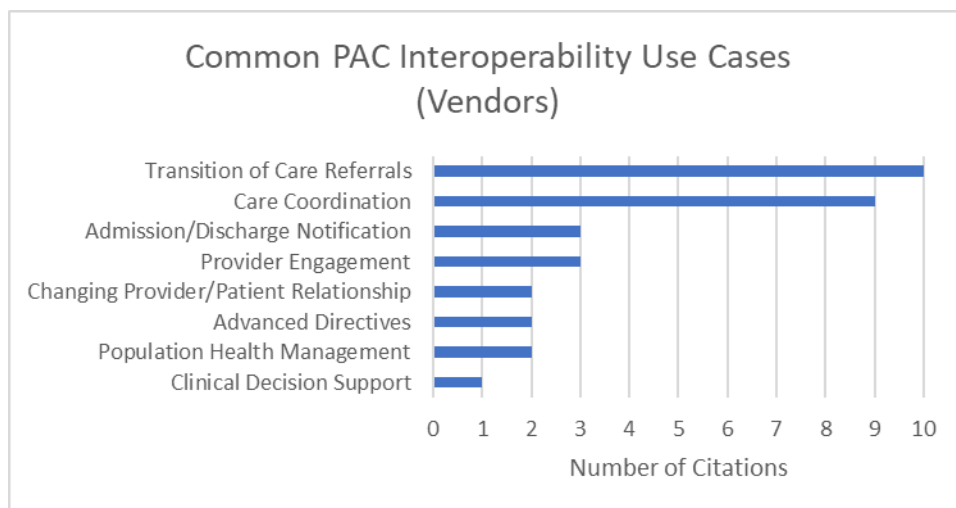


Figure 3: Vendor Interoperability Use Cases

Vendor Use Case 1: Transition of care referrals

Ten out of twelve vendors cited the importance of managing patient referrals and transitions between health care facilities, including discharge and transition information from the previous facility, patient intake in a new facility, information queries between transition facilities, consistent medication reconciliation, and clinical decision support.

Vendors articulated the need for:

- Sharing the cognitive and functional status of a patient
- Sharing interventions and medication summaries with the referring facility
- Providing the times of last medication doses given to the patient
- Facilitating medication reconciliation
- Facilitating workflow and interaction between caregivers and providers
- Helping the patient maintain information from different sources, so they have it on hand when visiting the doctor's office
- Maintaining a daily checklist of action items and identifying process gaps
- Access to patient demographics, lab results, and closed-loop referrals.

Vendor Use Case 2: Care coordination between multiple providers / proxy / family members

Nine out of twelve vendors cited care coordination as a use case for their software in the PAC space. This use case includes scheduling appointments, readmitting a patient into a facility, sharing the patient care plan with all stakeholders in the patient's care (including the family), sharing the patient chart with all stakeholders, and transportation to and from facilities.

Vendors articulated the need for technology that supports:

- Prescribers having patient medication lists, allergies, and interactions all documented in one place
- An outside provider (e.g., patient's primary care provider, other specialty providers, pharmacy, physical therapist, etc.) having the ability to provide oversight and integrate with the care team on dietary, behavioral health, and follow-up activities
- A master coordinator to share planning and care coordination for patients interacting with multiple providers
- Proxy access to support caregivers who understand the care plan and advocate for the patient
- Helping family members coordinate with each other to take care of an aging relative
- Maintaining a daily checklist of action items to identifying process gaps
- Access to patient demographics, lab results, and closed-loop referrals.

Vendor Use Case 3: Admission / discharge information notifications

Three out of twelve vendors indicated their customers need to send and receive admission and discharge notifications. Vendors believed admission and discharge notifications are important to

help all stakeholders in the patient care team track the status of the patient as they move through the health care system.

Vendors indicated that there has been a growing interest in admission and discharge notification so that providers know what care their patients are receiving after discharge.

Vendor Use Case 4: Provider engagement

Three out of twelve vendors mentioned that interoperability can be leveraged to help engage providers by allowing them to compare the quality of their care with other providers. One vendor emphasized the importance of making workflows easier for clinicians. Providers want to keep their clinicians happy by removing unnecessary clicks to update records, so they can spend more time with the patient.

Vendor Use Case 5: Technology changing relationship between patient and provider

Two out of twelve vendors indicated that the relationship between patient and provider is changing, moving from a face-to-face encounter to a greater use of devices to capture healthcare data, such as “wearable” devices, web and mobile applications, and voice recognition technologies. One vendor mentioned that this new relationship could also affect patient engagement.

Vendor Use Case 6: Advanced directives

Two out of twelve vendors highlighted the importance of having advanced directive information available at the point of care. One vendor expressed concern that EHR certification for advanced directives is “not meaningful”—often simply a checkbox indicating whether an advanced directive exists or not—so clinicians only know that an advanced directive exists, not what the directive indicates regarding the patient’s wishes. Certification requires that advanced directive information be stored, however it does not require sharing or notifying other providers about those directives. Although, Industry Standard Architecture (ISA) includes new health IT standards for Advance Directives, an opportunity exists for CMS to advance adoption of standards through regulation, including the draft USCDI expansion.

Vendor Use Case 7: Population health management administration

One vendor mentioned population health management as an important use case for PAC interoperability. The vendor thought it would be useful to be able to aggregate data, identify those patients who are high cost, and isolate gaps to determine if there is a better way to coordinate care.

Vendor Use Case 8: Clinical Decision Support

One vendor mentioned the importance of interoperability to support clinical decision support. Clinical Decision Support (CDS) is a system that advises healthcare professionals with knowledge and patient-specific data for best-practice clinical tasks to improve outcomes. CDS

systems rely on machine-computable data, including medical knowledge and longitudinal patient data from EHR systems, electronic clinical quality measure (eCQM) databases to determine best practices, and analytics to provide real-time information to clinicians. Interoperability across many systems is required for CDS to be effective.

3.1.4 Challenges

Vendors articulated several challenges to interoperability in the current PAC environment during the landscape analysis discussions, as shown in Figure 4.

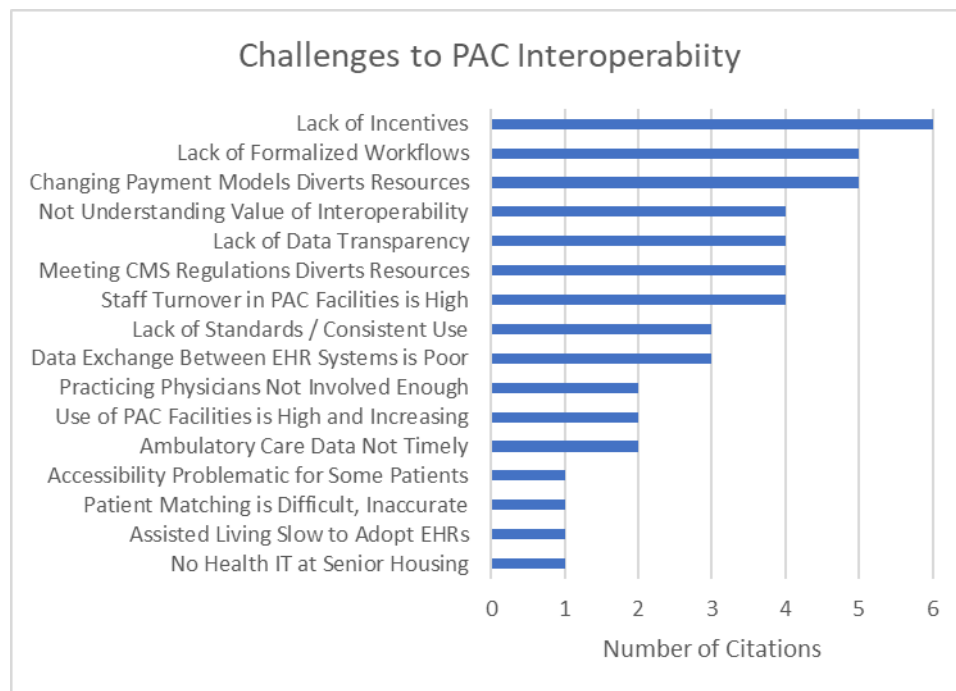


Figure 4: Vendor Challenges to PAC Interoperability

Vendor Theme 1: Lack of incentives

Six out of twelve vendors cited the lack of incentives for PAC providers as a challenge to investment in interoperability. Two vendors specifically mentioned that the financial incentives offered through Health Information Technology for Economic and Clinical Health (HITECH) Act excluded PAC. Additionally, they explained that PAC facilities have lower revenue levels as compared to hospitals, and therefore less funds to invest in advancing technology. One vendor stated that, due to Meaningful Use, hospitals have been incentivized to send messages to PAC, but PAC has not been incentivized to receive those messages; hospitals/physicians should be encouraged to receive information from PAC to support bi-directional exchange and care coordination.

Vendor Theme 2: Lack of formalized workflows

Five of the twelve vendors talked about the poor workflows in the healthcare ecosystem, noting that automation and efficiency are important. One participant recognized the need for seamless collection of information integrated as part of the normal workflow, but has found it difficult to achieve. Another participant posed the question, “Who is responsible for coordination for the entire healthcare continuum?”

Vendor Theme 3: Frequent changes to payment models diverts resources from investment in interoperability

Five of the twelve vendors mentioned that frequently changing payment models in PAC have been a challenge to achieving interoperability, and specifically discussed the upcoming payment model change from the Resource Utilization Group (RUG) to the Patient-Driven Payment Model (PDPM) for SNFs. The payment model itself was viewed favorably, however updating software to meet CMS requirements diverts resources that could be used to improve interoperability.

Vendor Theme 4: Limited understanding of interoperability and its value

Four out of twelve vendors raised the lack of education surrounding interoperability as a challenge. Vendors expressed a need for extensive and continuing education, supported by economic motivators, to drive change. Despite the availability of advanced technology and tools, customers will only use technology if it meets their business need. One participant explained that customers expect a high level of functionality and become disillusioned quickly when software does not meet their needs. Additionally, vendors identified a need for education in PAC leveraging experiences from the acute care setting with strong case studies for data exchange and adopted standards.

Staff retention (see Vendor Theme 7) was also cited as problem, resulting in a need for continuous training; new staff do not always understand the value of interoperability and how it impacts workflow.

Vendor Theme 5: Lack of data transparency

Four out of twelve vendors discussed the lack of data transparency as variances in data quality, sources, accuracy, and availability across the landscape. One vendor expressed concern about data blocking and expressed interest how the data block rule will address this problem. Another vendor discussed how many instances of information exchange are still lagging behind in the documentation of medications and integration with ancillary services at the point of care.

Vendor Theme 6: Meeting CMS regulatory requirements diverts resources from investment in interoperability

Four of the twelve vendors believed focus on satisfying CMS regulations results in PAC vendors diverting limited resources away from HIT innovation. Participants explained that the regulatory environment is more demanding in PAC than inpatient settings based on frequency, impact of changes, and “margins squeezed in every direction.”

Vendor Theme 7: Staff turnover in PAC facilities is high

Four of the twelve vendors expressed concern about high staff turnover in PAC facilities in recent years due to decreasing Medicare reimbursements, staff training costs, and competing with private industry that can offer higher wages. Vendors have experienced attrition rates in skilled nursing facilities (SNF) as high as 30 – 40%. High staff turnover results in increased training costs and hinders workflow continuity, which are important components of maintaining interoperability with other systems and stakeholders.

Vendor Theme 8: Lack of standards or consistent use of standards

Three out of twelve vendors highlighted the lack of standards as a challenge to interoperability. Standards in healthcare encompass “methods, protocols, terminologies, and specifications for the collection, exchange, storage, and retrieval of information associated with health care applications, including medical records, medications, radiological images, payment and reimbursement, medical devices and monitoring systems, and administrative processes”² One vendor indicated that standards use varies widely across HIEs, stating, “when you solve for one HIE, it’s only one HIE.” Another vendor asked, “How do we remove barriers from having different parts of healthcare addressing overlapping things?” (e.g., claims, health record data, and quality measures that are used in multiple areas of healthcare). Other vendors cited additional challenges with EHR systems (see Vendor Theme 11).

Vendor Theme 9: Data exchange between EHR systems is poor

Three out of twelve vendors observed problems with interoperability between EHRs, specifically exchanges between individual EHR systems and data broadcasts to multiple systems are still lagging behind. One vendor suggested a statutory mandate for PAC by which all EHRs must support a core 10 – 20 health data elements, similar to the Meaningful Use / MACRA CCDS.

Vendor Theme 10: Post-acute care utilization is high and increasing

Two vendors stated that focus on reducing length of stay at hospitals leads to more patients transitioning to PAC facilities. Both vendors believed hospitals frequently send patients to PAC facilities too early. One vendor voiced concerns that patients are being “pushed” out of the hospitals without proper transitions of care and said PAC usage is “through the roof.”

Vendor Theme 11: EHRs are difficult to use and burden clinicians

Two vendors described how EHRs impose unnecessary burden on clinicians. Both vendors stressed the importance of reducing input entry time. One vendor prioritized making the EHR intake admission process more efficient.

² Washington Publishing Company. 1998. *Overview of Healthcare EDI Transactions: A Business Primer*

Vendor Theme 12: Accessibility is problematic for some patients

One vendor described that accessibility can be a problem for patients. For example, cognitively impaired patients face challenges with accessing their health records via portals. The vendor stated, “Providers and vendors make it complicated to get to data. [Patients] must get through a portal to get access. So, if a patient has dementia, it makes it hard for family to access this data. It seems like the providers don’t want their patients to get the data.”

Systems that provide patient access can provide a way for patients to delegate access to family members, “proxies”, in case they are incapacitated. In most systems, patient records are tied to an account owned by a single individual. Support for proxy delegation would allow a patient to approve access by another party through a separate account. Then, if the patient becomes incapacitated, the patient’s information is accessible through the proxy’s credentials, without requiring the patient’s credentials.

Vendor Theme 13: Senior housing facilities do not employ any health IT infrastructure

One vendor explained how senior housing facilities consider themselves landlords and not healthcare providers. Therefore, they do not employ any health IT infrastructure to support interoperability in these facilities.

Vendor Theme 14: Assisted living facilities have been slow to adopt EHRs

One vendor explained that Assisted Living Facilities (ALF) also have not typically employed EHRs. The frailty of patients and the complexity of medication tracking/management has been increasing over the years, but EHR adoption had remained slow.

Vendor Theme 15: Data provided by ambulatory care are not timely

One vendor expressed concern that the timeliness of information sent by ambulatory health facilities is slow, and frequently not available to PAC facilities when needed.

Vendor Theme 16: Patient matching is difficult, inaccurate, and hard to automate

One vendor discussed the challenge of patient matching across healthcare organizations as an impediment to interoperability, citing the importance of having the right record for the right patient. Algorithms have been developed to match patients, but some manual matching is still required or preferred. Clinicians perceive manual patient matching to be burdensome.

3.1.5 CMS Policies / Assessments / Roles

This section explores vendor experience with CMS policies and assessments. Vendors were also asked what role CMS should play in the future.

Vendor Theme 1: All vendors track and follow CMS policies

Vendors indicated that CMS policies inform priorities in their product roadmap. One vendor expressed that complying with CMS policies is their “#1 priority,” while several others considered CMS policies as part of their routine business practice on a daily basis. One vendor observed that PAC facilities have concerns about CMS policies and the ongoing work necessary to comply with CMS regulations, stating “CMS may add a new ‘wrinkle’ to patient instructions and it’s important to be serving clients in a way that you should be.” Another vendor indicated that the CMS policies help educate providers on how they can achieve interoperability other than by using a fax machine.

Vendor Theme 2: Almost all vendors incorporate CMS assessments

For many vendor products, CMS assessments are required, so vendors integrate the assessments into their offerings. One vendor said they are “thrilled that CMS is working to align assessments and this is a long-term big step, especially as they look at care over time.” Another vendor shared that they have a policy team to help providers understand the assessments. A third vendor indicated that assessment support is a huge work effort for all their products.

Vendor Theme 3: Most vendors are aware of the CMS Data Element Library (DEL), two use it, and two promote the use of it

All but one vendor had heard of the DEL. Some vendors reported they actively promote usage of the DEL. Some vendors recognized the DEL as new service, are investigating it, and waiting to see how it develops before they commit to integrating it into their product plans. One vendor explained they are waiting for customers to request DEL integration as a feature. Another vendor expressed confusion about the value of the DEL, and indicated they use the Value Set Authority Center (VSAC) instead. Another vendor reported that the DEL was “based on standard assessment questions”, “not comprehensive enough for the information they want to share, such as medication lists”, “not used by acute-care systems”, and “needs to interact with all settings.” Another vendor said, “Glad CMS is doing their homework [with the DEL]. It is the first step to bigger standards. Assessment alignment is a big win for customers.”

Vendor Theme 4: Use of the CMS Quality Improvement and Evaluation System (QIES) is inconsistent

Some vendor products submit information to QIES. One vendor said they have not received customer requests to connect with QIES. One vendor indicated they had never heard of QIES. One vendor expressed interest in connecting to QIES, but stated that while some vendors have access to QIES data, “it is not widely available to all vendors. Only a few have access”.

Vendor Theme 5: Recommended Role of CMS

When asked about the role of CMS, vendors provided a variety of opinions, which directly conflicted in some cases. Figure 5 displays the responses.

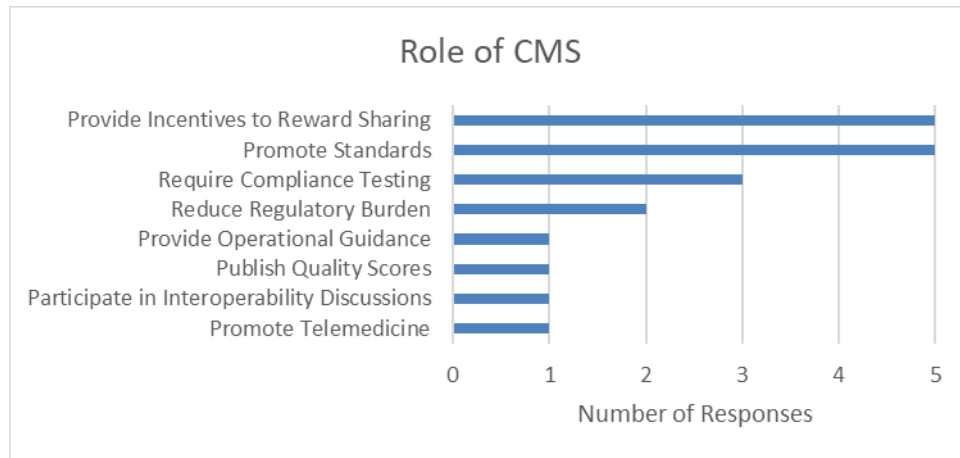


Figure 5: Vendor Citations in Role of CMS Discussions

Promoting standards and providing incentives that reward sharing information were the most frequent suggestions for actions CMS should take. Vendors expressed several different ideas about how CMS should promote standards. Two vendors thought that CMS should provide technical specifications on how to implement the standards, while another vendor thought technical specifications should be provided by another organization, such as HL7. One vendor thought that CMS should focus on “meaningful interoperability ... not just exchanging flat HL7[v2] files” and “not just from the hospital perspective.”

Several vendors recommended CMS take a role in compliance testing, with a focus on testing APIs for FHIR and C-CDA compliance. One vendor cautioned against critiquing the inner workings of the system, such as whether an allergy was captured correctly, which happened in the case of Meaningful Use.

Two vendors requested CMS reduce regulatory burden. As an example of unnecessary regulatory burden, one vendor referred to a Meaningful Use requirement for smoking status that was not clinically relevant to what EHR systems were already collecting.

Individual suggestions for CMS roles included:

- **Promote Telemedicine:** Demonstrate and use telemedicine in SNFs, particularly in urban environments. “Under Medicare, only rural SNFs can be originating sites and payments go to remote physicians. Skilled nurses, trained in telemedicine and reducing readmissions, only get a fraction of what physicians get.” CMS should reimburse care managers at rates comparable to that received by physicians to encourage utilization of

telehealth and to encourage better self-management of chronic diseases, in a way that is similar to home health agencies (HHA).

- **Publish Quality Scores:** Continue to use Medicare Compare sites to publish quality data on providers. CMS quality scores are a valuable input for PAC facilities, patients, and caregivers.
- **Provide Operational Guidance:** CMS provides high-level policy, but also more granular guidance, at the data element level (like DEL). Mid-level policies often do not include operational-level detail, which is needed.
- **Participate in interoperability discussions with industry.**

3.1.6 Current Level of Interoperability / Roadmap

This section discusses the current state of interoperability among vendors and how they are incorporating interoperability into their future product roadmap.

Vendor Theme 1: All vendors have an interoperability roadmap

All twelve vendors indicated they have a roadmap that addresses interoperability and many different paths were discussed. Three vendors indicated they were working on mobile applications. Two vendors said they are following the ONC roadmap and looking to use the Trusted Exchange Framework and Common Agreement (TECFA) core data set. One vendor said they are following a customer-driven roadmap based on feedback. Another vendor is focused on developing a social data model, including non-medical data, such as whether patients have access to transportation, whether there are guns in the patient's home, etc. Capturing relevant social data using FHIR presents unique challenges because data is not widely available at a level more granular than for population-oriented models. A third vendor described efforts to develop connections with other health IT providers.

Vendor Theme 2: Demand for certification is inconsistent and can be customer-driven

Eight out of twelve vendors indicated that some of their products are certified, however discussion on this topic was inconsistent. Some vendors claimed that a non-certified product is less likely to sell, and certification is a required feature for many clients. However, others did not believe vendors who certified their products saw any uptick in their customer base and that providers that did use certified products did not see improvement in information exchange. As a result, economic incentives can be low for vendors to certify. One vendor claimed they only pursue certification if customers ask for it or it is required for a particular installation.

One participant expressed an opinion that 2015 certification is an improvement over the 2014 version. One PAC vendor certified to the 2014 Ed CPOE, drug-drug, drug allergy interaction checks, medication list, medication allergy list requirements. The 2014 edition contained elements that did not make sense in the PAC space. Detailed information about future certification plans among PAC providers may require additional stakeholder engagement.

Vendor Theme 3: Most vendors are aware of CMS Administrator Seema Verma’s comments on interoperability

Ten out of twelve vendors were aware of the interoperability comments made by Administrator Verma³ ⁴ and at least two of them attended her presentations personally. All ten vendors described efforts to actively incorporate the Administrator’s comments into their roadmaps, including developing open APIs. One vendor said the Administrator’s comments were “job #1,” and they were “actively participating” in the development of standards. Another vendor said they are “very involved” in developing standards and tie CMS’s vision with those of ONC and US Core Data for Interoperability (USCDI) conversations. Another vendor said they are “very optimistic” about CMS’s vision, that it is “the right thing to do,” and that they “want to lead.” Consistent with the Administrator’s vision, some vendors write reviews or develop tools that help providers select interoperable products. One vendor said they will implement open application programming interfaces (API) but not get involved in standards development.

Vendor Theme 4: All vendors are aware of FHIR and most are developing FHIR APIs

All twelve vendors are aware of FHIR and actively working with FHIR, ranging from experimentation to product integration to full participation in the development of FHIR resources and FHIR working groups. Ten vendors are doing some development with FHIR APIs, and at least four vendors are looking to integrate SMART on FHIR authentication and authorization into their products. Most vendors viewed FHIR positively, believing it has the potential to, “encourage the adoption of standards,” and “more work needs to be done with FHIR, but it is on the right path,” and that “from the technical side, RESTful APIs are easier to work with.”

Other vendors were more tentative about FHIR, saying that it is “not the be all and end all” and that the “challenge with any standard is how everyone keeps to a standard.” One vendor didn’t think that FHIR would be successful since it doesn’t normalize the data model itself and is a “non-standard” standard. This particular vendor left the FHIR community early on, however, and may not be aware of recent developments around the FHIR standard, specifically Implementation Guides, profiles, and extensions that can be used to normalize data models. Another vendor said that FHIR currently “doesn’t map well to PAC,” but acknowledged PAC vendors and providers need to be more active in HL7 working groups.

Vendor Theme 5: Most vendors are using C-CDA R2.1

Seven out of twelve vendors said they support C-CDA R2.1 and at least two vendors actively participate in the development of C-CDA. One vendor reported that some vendors only certify to R1.1 because they believed PAC facilities have lost interest in pursuing certification. Another vendor believed that inpatient certification didn’t improve healthcare quality.

³ <https://www.cms.gov/newsroom/press-releases/speech-remarks-cms-administrator-seema-verma-himss18-conference>

⁴ <https://www.cms.gov/newsroom/press-releases/speech-remarks-administrator-seema-verma-onc-interoperability-forum-washington-dc>

One vendor said that the C-CDA specification is still incomplete, despite a “500 – 600 page” implementation guide, leading to different interpretations of the standard. Another vendor predicted that C-CDA will not “die off since it is so commonly used.”

Vendor Theme 6: All vendors have connections with HIEs

All twelve vendors indicated that they have connections with HIEs. CommonWell and Carequality were the most frequently mentioned HIEs during discussions. At least four vendors stated that they were connected to CommonWell. One vendor was connected to both CommonWell and Carequality, and another vendor connected to CommonWell also had plans to connect to Carequality this year. Some vendors connect with state HIEs as well. One participant said that vendor connections with HIEs have reached the tipping point such that they are seeing real added value provided by HIEs. Another vendor thought HIEs were “good in concept,” but was skeptical of their long-term sustainability. The vendor observed that many HIEs are regionally focused and implementation of standards varies across HIEs, limiting their value proposition.

3.2 PAC Providers

Three PAC providers and four provider membership organizations participated in the interoperability landscape analysis discussions to provide their perspectives on the current status of interoperability in PAC.

3.2.1 Use of Electronic Health Record Systems

The interoperability landscape analysis discussions covered several topics related to the use of EHR systems by providers, resulting in several themes.

Provider Theme 1: All providers are currently using EHR systems and most provider membership organizations are using EHR systems

As stated in Section 2.2.3, this landscape analysis revealed that use of EHR systems is widespread among PAC providers. All three provider participants use EHR systems.

Provider membership organizations indicated 80% of their members use EHRs and that adoption is driven by the need to submit billing requests and assessment data through Outcome and Assessment Information Set (OASIS), Minimum Data Sets (MDS), and other instruments. However, one provider said despite having an EHR system, they “still have paper-based workflow between ambulatory/homecare and hospitals” within the same organization.

While most providers find EHRs useful, some reported negative experiences. One membership organization said that some smaller providers are “second implementers;” unhappy with the first EHR system, they later adopted different EHR system. Another member organization said that an “EHR will help with some efficiencies, but not necessarily time,” adding “If you could streamline a prior authorization form and integrate it into an EHR for Medicaid patients, that would help adoption.”

One provider organization cited cost as a barrier to adopting EHR systems, especially for small practices.

Provider Theme 2: Many providers are using multiple EHR systems and struggle with interoperability between those systems

All three providers participating in the landscape analysis use multiple EHR systems in their organizations. One provider expressed confidence that there are many good vendor solutions available and EHR systems communicate well across their organization. The other two providers have had more difficulty getting different EHR systems to interoperate. Three participants indicated problems connecting other EHR systems with Epic systems.

Provider Theme 3: Most providers are using certified EHR systems, but certification does not always make sense for PAC providers

All providers in our discussions are using certified EHR systems. Provider membership organizations indicated that most acute care EHR systems are certified at the hospital level and a majority of EHR systems are certified at the ambulatory level. One membership organization said that many PAC facilities “probably aren’t certified” since they did not receive incentives under Meaningful Use, adding that certification sometimes does not make sense in some PAC environments since a lot of the certification categories don’t apply.⁵

Provider Theme 4: EHR system components used by providers

Figure 6 displays the 8 EHR components used by PAC providers.

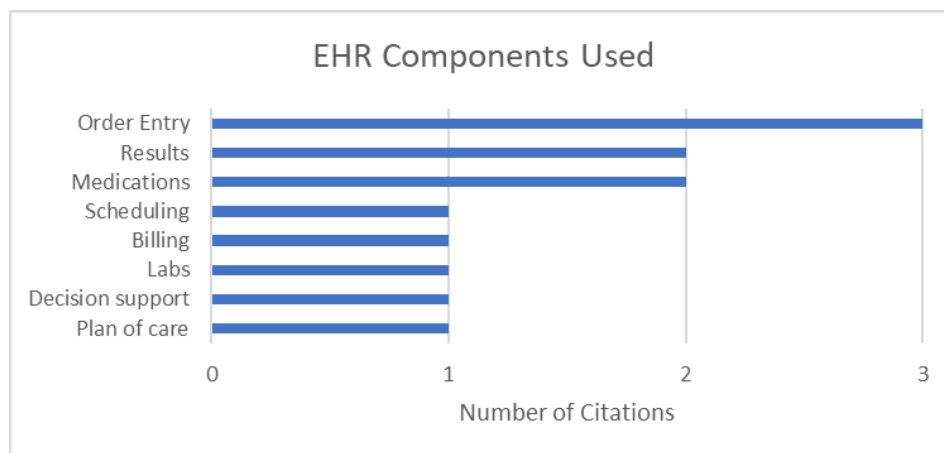


Figure 6: EHR Components Used by Providers

⁵ We note the requirements of the 2015 Edition Base EHR Definition can be met using one certified Health IT Module or a combination of certified Health IT Modules, such that vendors can certify to the functionality relevant to provider needs. https://www.healthit.gov/sites/default/files/2015edition_base_ehr_definition_ml_11-4-15.pdf

Providers mentioned three EHR components that they do not use. One provider does not currently use decision support, although they are looking to use it in the future. Another provider from acute care does not use population health features since the “public health category does not apply to Meaningful Use.” A third provider said they do not use the billing feature within their EHR because they are designing their own custom billing system. Detailed information on why providers choose not to use specific EHR features would require additional stakeholder engagement because this information was not in the scope of the current discussions.

3.2.2 Use Cases

During the course of discussions with providers, several use cases were discussed, as shown in Figure 7.

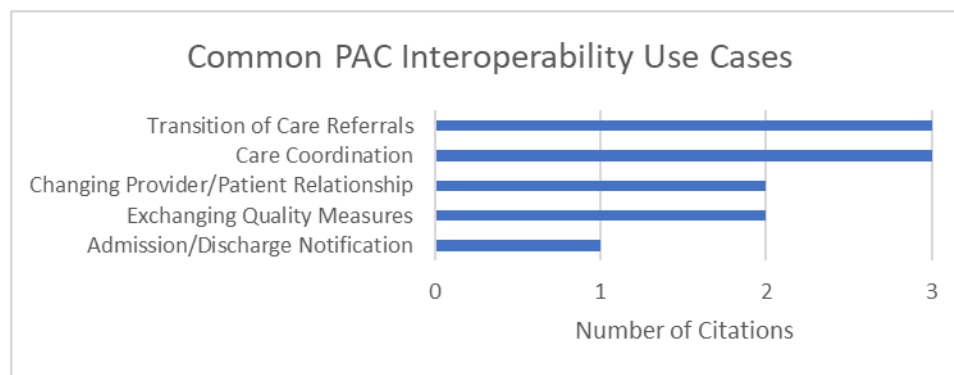


Figure 7: Provider Interoperability Use Cases

Provider Use Case 1: Care coordination between multiple providers / proxy / family members

Three out of seven providers mentioned care coordination as a PAC interoperability use case. One provider said that “joining with hospitals to prevent readmissions was incentive enough.” Another provider said that increased interoperability with care coordination could result in creation of more meaningful quality measures, particularly in continuity of care. A third provider said that if patients are motivated to have access to their medical data, that will motivate providers to improve interoperability with each other.

Provider Use Case 2: Transition of care referrals

Three out of seven providers cited transition of care referrals as a key use case for PAC interoperability. One provider noted the benefit of the PAC provider having access to information about patient needs before the patient reaches the provider because if the PAC provider does not have the resources to take care of that patient, the patient can be redirected to

another provider. For example, a patient may require specialized stroke rehabilitation after a hospital stay. To accurately assess the patient, the PAC provider would need access to the patient's medical information in advance and then make a decision whether their organization has the resources to meet the patient's needs.

Another provider stressed the need to ensure safe transitions of care by maintaining comprehensive transition documents that summarize the care and state what the patient needs in the next step of care. It should be clear "where we left the patient's care" from the hospital discharge data.

Provider Use Case 3: Technology changing relationship between patient and provider

Two out of seven providers noted that the relationship between the patient and caregiver is an important use case of PAC interoperability. One provider said greater interoperability would improve patient engagement. Another provider said that making systems patient-facing would motivate greater interoperability through the rest of the healthcare system.

Provider Use Case 4: Exchanging quality measures

Two providers believed making quality measures more interoperable would allow better medication reconciliation. Quality measures can be exchanged using the Quality Reporting Document Architecture (QRDA) or FHIR, which can help an admitting provider understand the quality of care the patient has received at a discharging provider. One provider said that one medication measure used in nursing home settings (MDS), is not useful for pharmacy, which is important for medication reconciliation between the PAC facility and the pharmacy.

Provider Use Case 5: Admission / discharge information notifications

One provider said there is a "wealth of knowledge in Admission Discharge Transfer (ADT) feeds that have existed for a long period of time and a big source of data."

3.2.3 Challenges

Providers cited several challenges to interoperability in the current PAC environment during the landscape analysis discussions, as shown in Figure 8.

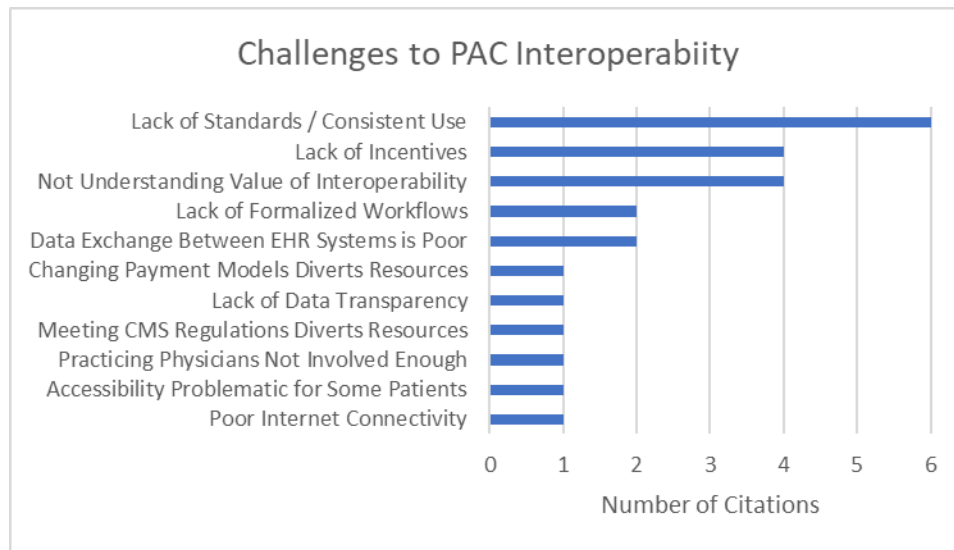


Figure 8: Provider Challenges to PAC Interoperability

Provider Theme 1: Lack of standards or consistent use of standards

All except one provider cited lack of standards as a key challenge to interoperability. One provider suggested a need for “fully structured data – no compromises.” Another provider reported success in exchanging information with hospitals, but experienced difficulty exchanging and understanding transition metrics for behavioral health information. Further clarification on behavioral health metrics may require additional stakeholder engagement because this information was not in the scope of the current discussion. A third provider stressed the economic benefit of implementing standards, stating “the more standards that are available, the lower the cost per transaction for any customer that wants to connect to services.”

Provider Theme 2: Lack of incentives

Four out of seven providers indicated that a lack of incentives has hindered progress toward interoperability for PAC facilities. One provider observed that the lack of available incentives prevents small practices from adopting EHRs and also limits growth of telehealth in the PAC space. “Telehealth is huge and there are initiatives, but they are not reimbursed by Medicare.”

Some providers have persevered despite the lack of incentives. One provider said, “during [implementation of] the [Improving Medicare Post-Acute Care Transformation Act of 2014] IMPACT Act, there were no incentives for SNFs to [adopt] EHR [systems], but they wanted to be ahead of the curve.”

Another provider commented that CMS needs to develop incentives that promote and improve interoperability, not just require providers to submit data.

Provider Theme 3: Lack of understanding of interoperability and its value

Four out of seven providers said that many PAC providers still do not understand the value of interoperability. One provider reiterated the need to get people to care about interoperability, adding that “carrots, sticks, and shame are motivators.” Another provider claimed that

“interoperability is not at the top of the list for clinicians.” Another said that providers need to understand that the “notion of interoperability goes past the basic notion of sending a [Portable Document Format file] PDF.”

Provider Theme 4: Data exchange between EHR systems is poor

Two providers expressed frustration with the difficulty in exchanging data between EHR systems. One provider membership organization claimed that a member medical center uses Epic as their outpatient system and Cerner for inpatient use, yet there is no communication between the two systems. That provider stressed the need for EHR systems to “buy into” and use data standards. Another provider said that Epic systems do not provide the necessary interfaces to exchange data with other non-Epic EHR systems.

Provider Theme 5: Lack of formalized workflows

Two providers indicated that lack of formalized workflows in healthcare facilities prevent interoperability. One provider stated that facilities need to “stop clinicians from being independent and using 10 different ways to discharge a patient.”

Provider Theme 6: Internet connectivity for some healthcare facilities is poor

One provider discussed the importance of recognizing internet connectivity in rural areas may be a challenge and that these providers should not be left behind when discussing interoperability. The provider stated that “SNFs in rural areas are most likely to have this issue.”

Provider Theme 7: Frequent changes to payment models diverts resources from investment in interoperability

One provider expressed concern that changing payment models hinders interoperability, suggesting they “would normalize all the payment methods that CMS has.”

Provider Theme 8: Meeting CMS regulatory requirements diverts resources from investment in interoperability

One provider cited the “fast and furious” pace of regulations as an impediment to interoperability, adding “it is difficult for a small firm to keep up.”

Provider Theme 9: Lack of data transparency

One provider said that the current healthcare “landscape and information blocking is not conducive to interoperability.”

Provider Theme 10: Accessibility is problematic for some patients

One provider stressed the importance of “pushing harder on patients to get their own data,” saying that current non-interoperable systems make it difficult for patients to obtain their own data. This is consistent with Administrator Verma’s^{6 7} experience trying to retrieve her husband’s medical data.

Provider Theme 11: Practicing physicians are not involved enough in standards development and software design

One provider described the lack of involvement from practicing physicians in standards development and software design, which leads to the implementation of EHRs that continue to be burdensome.

3.2.4 CMS Policies / Assessments / Roles

This section explores provider experience with CMS policies and assessments. Providers were also asked what role CMS should play in the future.

Provider Theme 1: All providers incorporate CMS assessments

All providers in the landscape analysis said they incorporate CMS assessments in their operations. One provider expressed appreciation of CMS’s effort to standardize assessments and believed that once interoperable, assessment could provide a better longitudinal view of the patient as they move through the healthcare system. Another provider observed that it is difficult for small providers to keep up with the “fast and furious” pace of new assessments and comment on them when appropriate.

Provider Theme 2: Recommended role of CMS

When asked about the role of CMS, providers expressed wide variation in opinions, as shown in Figure 9.

⁶ <https://www.cms.gov/newsroom/press-releases/speech-remarks-cms-administrator-seema-verma-himss18-conference>

⁷ <https://www.cms.gov/newsroom/press-releases/speech-remarks-administrator-seema-verma-onc-interoperability-forum-washington-dc>

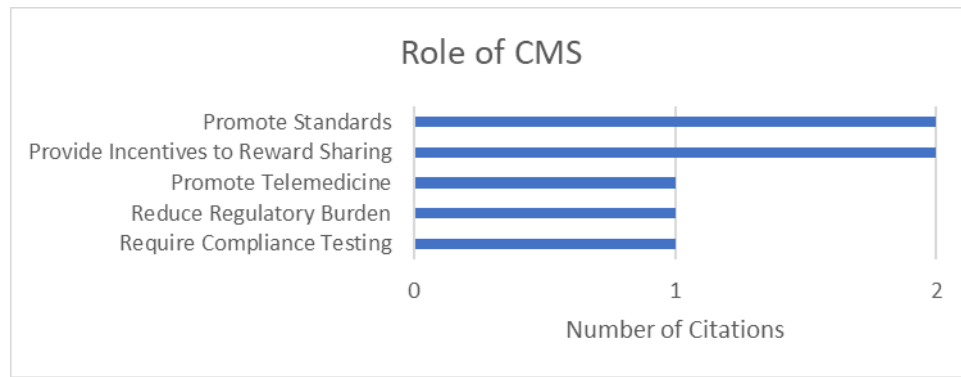


Figure 9: Provider Citations in Role of CMS Discussions

Like vendors, providers cited promoting standards and providing incentives that reward sharing as the most frequent recommendations for actions CMS should take.

Other suggestions included promoting telemedicine, reducing regulatory burden, and requiring compliance testing.

3.2.5 Current Level of Interoperability / Roadmap

This section discusses current state of interoperability among providers and how they are incorporating interoperability into their future roadmaps.

Provider Theme 1: All except one provider has an interoperability roadmap

Six out of the seven provider organizations indicated they have an organizational roadmap that includes interoperability. One provider said that preventing hospital readmission is enough incentive to include interoperability as part of their roadmap.

Provider Theme 2: All providers' EHR systems are certified and provider membership organizations indicate most of their providers are certified

All three providers who participated in the landscape analysis use certified EHR systems, although one provider also uses a European EHR system that is not certified. Provider membership organizations indicated that most providers are certified. One organization noted that all hospitals and most of ambulatory care facilities are certified. Other organizations said they do not have exact figures but believe most of their members use certified EHR systems.

Provider Theme 3: All providers and provider membership organizations are aware of the CMS DEL and two providers use it

The DEL is well-known by providers and provider membership organizations that participated in the landscape analysis and this topic for discussion generated many comments. Two providers

are actively using the DEL as part of their measure reporting. Several providers suggested improvements to the DEL, including:

- “The DEL should be reconciled with FHIR resources.”
- “There are many sources of truth ... there are 35 (*Qualified Clinical Data*) Registries and we have found only 11 items that were common. There were 25 different variations of asking about the sex of a patient... Why was the DEL created when there [are] already multiple repositories.”
- “The DEL is difficult to navigate” (although this comment likely reflected the old DEL user interface).
- “We like the DEL, but physicians do not know about the DEL and they were not involved. We need people who can translate DEL information at the physician, nurse-practitioner level.”

Provider Theme 4: Most provider organizations are aware of Administrator Verma’s comments on interoperability

All except one provider is aware of the comments Administrator Verma made on interoperability. Several providers watched her speech,^{8 9} and one provider thought it was “very cool and forward looking.”

Provider Theme 5: All provider organizations are aware of FHIR and most are developing with or investigating FHIR

Few providers are actively using FHIR in production today, but all responded that they know about FHIR and several are doing active FHIR development. One organization has published 40 FHIR resources. Another provider organization is developing implementation guides and working with EHR vendors. Others are investigating how FHIR can be used and some are waiting for other partners to start using FHIR before investing time with FHIR.

Provider Theme 6: Some providers do not use C-CDA, and according to provider membership organizations, those that do are believed to be using R1.1

Two providers said they do not use C-CDA, while a third stated that they often need more granular data, such as lab results, which can be done through a FHIR query without retrieving the entire medical record in C-CDA. Many providers also use DIRECT messaging.

One provider membership organization indicated that R1.1 of C-CDA is the version that most PAC providers use since many PAC organizations have lost interest in pursuing certification.

⁸ <https://www.cms.gov/newsroom/press-releases/speech-remarks-cms-administrator-seema-verma-himss18-conference>

⁹ <https://www.cms.gov/newsroom/press-releases/speech-remarks-administrator-seema-verma-onc-interoperability-forum-washington-dc>

Provider Theme 7: Most providers have connections with HIEs

All except two providers actively connect and exchange data with HIEs. Carequality was the HIE most frequently referenced by providers. One provider does not consider a centralized HIE to be significant part of what they do. Another provider said that it is “faster to export the C-CDA and fax it to the hospital instead of exchanging that data through the HIE.”

Provider membership organizations indicated that several of their members use HIEs. One membership organization is creating quality measures involving HIEs.

3.3 Other Comments

During discussions, some additional comments were made by participants.

Comment 1: Some participants expressed concern that CMS does not always sufficiently consider the unique characteristics of PAC when making policy

Two participants mentioned that CMS is “ignoring” some aspects of PAC, particularly regarding the standards for electronic prescribing. A provider mentioned that electronic prescribing is increasing, but it is not necessarily interoperable. Since a vast majority of conditions are treated through medication, this is important area for CMS to consider.

Another provider said that certification criteria and categories do not always make sense in certain PAC settings.¹⁰ CMS should consider all PAC settings when generating certification criteria.

Comment 2: Practicing physicians are not involved enough in standards development and healthcare software design

One participant expressed the opinion that most people involved in policy-making are career administrators and have not seen patients or practiced in the past 30 years. That participant encouraged CMS to recruit and involve more practicing physicians as “subject matter experts” in working groups.

Another participant mentioned that in some EHR systems, it takes 20 clicks to order Tylenol, and said streamlining workflows in EHR systems would be crucial to gaining greater support from clinicians for interoperability.

¹⁰ As previously noted, we note the requirements of the 2015 Edition Base EHR Definition can be met using one certified Health IT Module or a combination of certified Health IT Modules, such that vendors can certify to the functionality relevant to provider needs.

https://www.healthit.gov/sites/default/files/2015edition_base_ehr_definition_ml_11-4-15.pdf

3.4 Summary

Vendors and providers alike mentioned several common interoperability use cases and challenges during their discussions. Table 2 summarizes the number of vendors and providers that expressed common use cases for interoperability.

Table 2: Interoperability Use Case Summary

Use Case	Vendors	Providers	Total
Transition of care referrals	10	3	13
Care coordination between multiple providers / proxy / family members	9	3	12
Admission / discharge information notification	3	1	4
Technology changing relationship between patient and provider	2	2	4
Provider engagement	3	0	3
Advanced directives	2	0	2
Exchanging quality measures	0	2	2
Population health management administration	2	0	2
Clinical decision support	1	0	1

Table 3 summarizes the number of vendors and providers that expressed common challenges for PAC interoperability.

Table 3: Interoperability Challenges Summary

Challenge	Vendors	Providers	Total
Lack of incentives	6	4	10
Lack of standards or consistent use of standards	3	6	9
Limited understanding of interoperability and its value	4	4	8
Lack of formalized workflows	5	2	7
Frequent changes to payment models divert resources	5	1	6

Challenge	Vendors	Providers	Total
Meeting CMS regulatory requirements diverts resources	4	1	5
Lack of data transparency	4	1	5
Data exchange between EHR systems is poor	3	2	5
Staff turnover in PAC facilities is high	4	0	4
Practicing physicians are not involved enough in standards development and software design	2	1	3
Use of post-acute care facilities is high and increasing	2	0	2
Accessibility is problematic for some patients	1	1	2
Data provided by ambulatory care are not timely	2	0	2
Internet connectivity for some healthcare facilities is poor	0	1	1
Senior housing facilities do not employ any health IT infrastructure	1	0	1
Assisted living facilities have been slow to adopt EHRs	1	0	1
Patient matching is difficult, inaccurate, and hard to automate	1	0	1

4. Recommendations / Next Steps

All of the participants in the landscape analysis have roadmaps to achieve greater interoperability, and almost all are including FHIR development within that roadmap. In order to leverage the momentum building in the PAC community around interoperability and FHIR, the MITRE team recommends the following next steps.

Recommendation 1: Continue to engage with ONC and other components within CMS to ensure that PAC is included in broader interoperability efforts

PAC is a critical part of the overall healthcare system,^{11 12} and CMS should continue to work with ONC to ensure that regulations, incentives, and guidance include PAC perspectives and harmonize with other standards and interoperability initiatives across healthcare. CMS also should consider developing additional software tools to ensure that meaningful interoperability can be measured and improved repeatedly over time. Examples of existing software tools include the ONC Inferno project and Aegis Touchstone, which validate that FHIR APIs conform to FHIR Implementation Guide specifications.

Recommendation 2: Consider transitioning the DEL codes into the VSAC for hosting

Participants appreciated CMS's efforts to standardize assessments as a positive and necessary step towards interoperability, however some participants reported confusion between the roles of the DEL and VSAC. The work to develop and standardize DEL codes should continue as planned, but CMS should investigate leveraging the VSAC platform to host the DEL codes to provide a consolidated repository for vendors and providers to reference value sets and eliminate the cost of maintaining a separate library. The VSAC system also supports a FHIR API.¹³

Recommendation 3: Collaborate with the CMS Quality Payment Program (QPP) team to harmonize with the Electronic Clinical Quality Improvement (eCQI) Resource Center

New APIs developed for PAC interoperability should be documented within the eCQI Tools and QPP Developer Tools section of the eCQI Resource Center to provide a consistent, consolidated resource for vendors and developers to reference when developing products.

https://ecqi.healthit.gov/ecqms#quicktabs-tabs_ecqm1

Recommendation 4: Establish a PAC Interoperability Working Group to support industry interoperability activities

When participants were asked what aspirations they had for future interoperability efforts, the most common response was to motivate stakeholders to engage in frequent dialogue to achieve consensus on a standard way to exchange data. Several participants facetiously suggested they

¹¹ <https://www.hhnmag.com/articles/7421-why-post-acute-care-partners-are-critical-to-hospitals-future>

¹² <https://www.managedhealthcareconnect.com/articles/importance-post-acute-care>

¹³ https://www.nlm.nih.gov/pubs/techbull/nd17/brief/nd17_vsac_fhir.html

would like to “lock stakeholders in a room and not let them leave until there is agreement on a standard way to exchange data.” While that is extreme, it does highlight the attention to detail required to make widespread interoperability a reality. Another participant discussed creating a public-private partnership focused on this activity.

Generating FHIR Implementation Guides for PAC, building implementations, conducting connectathons, and gaining broad industry approval can be done piece by piece in agile six-month sprints, but it will take several years to cover all of the data models and interoperability needed in PAC. Maintaining continuity year over year will be imperative to achieving these results. An organization focused on defining the necessary PAC data models and APIs must also be sustainable to complete the task. Creating a venue for collaboration between vendors, providers, CMS, ONC, the Department of Veterans Affairs (VA), and other stakeholders could provide sustainability and offer the diverse expert perspectives required to generate data models and APIs that can harmonize with the rest of healthcare. Creating a PAC Interoperability Working Group with dedicated stakeholders from across PAC, including some members from other parts of healthcare, would provide the necessary focus to achieve interoperability goals, as demonstrated by the Argonaut, SMART on FHIR, Blue Button 2.0, and Da Vinci projects. Such a working group would provide an opportunity for CMS to define how data is exchanged between providers and CMS and lay the groundwork for interoperable exchange of data between providers by engaging in the following activities:

- **Create sustainable governance and branding for the PAC Interoperability Working Group**

Organization and establishment of roles and responsibilities of the PAC Interoperability Working Group is essential to success. “Committed” members are those who can be relied upon to provide consistently meaningful contributions to the project necessary to sustain significant forward momentum. Committed members could potentially contribute in a number of ways, including: developing, evangelizing, reviewing, testing, and advising. Roles may evolve over time, but an initial set of responsibilities for committed members is necessary to establish expectations for the working group.

The PAC Interoperability Working Group should be open to anyone, including HIT vendors, clinicians and other stakeholders who have a shared interest in advancing interoperability. Several participants in the landscape analysis have already expressed interest in participating in the working group, as have members of the DEL HITWG run by CMS. Upcoming conferences, such as the Healthcare Information Management and Systems Society (HIMSS) meeting, provide additional opportunities to recruit members to the working group.

- **Participate in the appropriate HL7 Working Group(s)**

To best engage the FHIR community, it is important to connect with groups that share and potentially overlap with functionality required by the PAC community. The CMS and MITRE team should attend various HL7 working group meetings and determine which working group is the best one to guide and support interoperability efforts.

- **Identify agile, tightly-scoped use case to implement**

Once the PAC Interoperability Working Group begins meeting, the first task should be to decide on a tightly-scoped use case that can be designed and implemented in time for a connectathon at the September 2019 HL7 FHIR Working Group Meeting.

- **Develop FHIR Implementation Guides for use case data models**

The next step should be breaking down the use case into required systems and data models that can be exchanged between those systems. Each of the data models and associated APIs must be defined as a FHIR Implementation Guide. Task owners and teams must be assigned to develop the Implementation Guide and build the underlying prototype to implement the Implementation Guide.

- **Review and harmonize FHIR Implementation Guides with key stakeholders**

As each Implementation Guide is completed, it should be reviewed first by the PAC Interoperability Working Group and then with other HL7 FHIR Working Groups, the HITWG, and other stakeholders to harmonize with other initiatives across the FHIR landscape.

- **Host / participate in a connectathon**

Once the Implementation Guides have been successfully reviewed and working prototypes have been built, the PAC Interoperability Working Group should host a connectathon in September 2019 and/or May 2020. FHIR connectathons provide a unique opportunity to invite other FHIR developers to debug and connect to PAC prototype systems developed by the PAC Interoperability Working Group.

- **Build industry consensus around Implementation Guides**

After successful working prototypes of the FHIR Implementation Guides have been built and tested, the PAC Interoperability Working Group should continue to work to gain broader industry consensus towards acceptance as a standard in the FHIR community.

- **Identify next agile part of use case to implement and repeat**

Once the initial use case has been prototyped and shown to work successfully, it can provide a platform for continual, progressive development for additional use cases, adding more and more capabilities. By continuing to define additional tightly-scoped use cases that leverage previous use cases, new capabilities can be agilely added every four to six months to align with follow-on connectathons.

Recommendation 5: Streamline and Harmonize Regulatory Requirements to the Greatest Extent Feasible

In response to stakeholder feedback that meeting CMS regulatory requirements diverts resources from investment in interoperability, CMS should continue to identify opportunities for alignment of regulatory requirements across programs and to implement the Meaningful Measures Initiative, creating a streamlined and parsimonious measure set that reduces burden. Additionally, CMS should emphasize to providers that investment in interoperability in many

cases likely will reduce future burden associated with some regulatory requirements, specifically quality reporting requirements; improved interoperability reduces duplication of efforts and improves workflow.

Recommendation 6: Add FHIR API to iQIES system

CMS should implement a FHIR-based API to the iQIES system to provide a convenient, accessible mechanism to share quality improvement and evaluation data with other systems that can benefit from this information. Access to sensitive data should be protected through SMART on FHIR authentication and authorization using OAuth 2.0 and OpenID Connect, similar to what is implemented in Blue Button 2.0.

5. Conclusion

There are many independent initiatives working on interoperability in healthcare, both within the United States and internationally, many within the HL7 FHIR community. Each of these initiatives is tackling healthcare interoperability from a different perspective and common data elements can overlap significantly between those initiatives.

Healthcare interoperability is a significant challenge and multiple coordinated initiatives are necessary to provide the focus necessary to address specific interoperability challenges for each area of healthcare. These initiatives raise several key considerations:

- 1) Patient- and consumer-centered initiatives, such as Apple Health Kit, Blue Button 2.0, and the CARIN Alliance, can motivate patients to help drive consumer and economic demand for interoperability across the healthcare system.
- 2) Potential overlap across data models needed by these initiatives raises the importance of defining and harmonizing PAC needs with the rest of healthcare while the data models are still being defined.
- 3) Ten out of twelve vendors reported that their customers (e.g., providers) are requesting improved interoperability.
- 4) Ten out of twelve vendors and three out of seven providers identified Transitions of Care and nine out of twelve vendors and three out of seven providers identified Care Coordination as key use cases for PAC interoperability. In addition, vendors articulated the need for sharing the cognitive and functional status of a patient and sharing interventions and medication summaries with the referring facility, which supports current CMS policies on implementation of Standardized Patient Assessment Data Elements (SPADEs). Transitions of Care and Care Coordination should be prioritized in future data model discussions and proof of concept implementations because availability of patient discharge information at the time of admission would improve quality of care and patient outcomes.

- 5) One vendor specifically identified patient-matching challenges and authentication/ authorization (e.g. SMART on FHIR) across systems as critical hurdles to meaningful interoperability. Sharing sensitive health data efficiently highlights the need for accurate, automated patient-matching and robust, but streamlined, authentication and authorization management across multiple organizations.

The convergence of these circumstances necessitates making progress on PAC interoperability activities as soon as possible. Initiatives are moving quickly to define and standardize data models in healthcare; CMS must ensure that PAC factors are considered before FHIR data model definitions are finalized.

Appendix A. Background

In the past decade, Congress passed several incremental pieces of legislation to increase EHR adoption/utilization and ultimately promote health information exchange. However, these incremental changes have addressed individual parts of the healthcare spectrum, inadvertently creating electronic siloes. There are many independent initiatives working on interoperability in healthcare, both within the United States and internationally. Some of those initiatives include the HL7 Argonaut Project,¹⁴ SMART on FHIR,¹⁵ Blue Button 2.0,¹⁶ Apple Health Kit,¹⁷ CARIN Alliance,¹⁸ Da Vinci Project,¹⁹ Poplin Project,²⁰ and Standard Health Record.²¹ Several HL7 Working Groups are also working on healthcare interoperability. Each of these initiatives is tackling healthcare interoperability from a different perspective, and common data elements can overlap significantly between those initiatives.

With Administrator Verma's vision for interoperability and associated CMS and ONC rulemaking, there is increased attention and optimism from the industry that moving forward, efforts to promote interoperability will include a more holistic, cross-setting approach.

A.1 Relevant Legislation / Regulation

Multiple legislative and regulatory actions promote innovation in Health Information Technology (HIT) and interoperability.

A.1.1 HITECH Act (Meaningful Use)

The Health Information Technology for Economic and Clinical Health (HITECH) Act²² was enacted as part of the American Recovery and Reinvestment Act (ARRA) in 2009. The principal goal was to promote and increase Meaningful Use of HIT among eligible providers and hospitals; PAC was excluded from the incentives program. The HITECH act mandated:

- The establishment of the Office of the National Coordinator (ONC) to support and coordinate nationwide efforts to adopt HIT and promote interoperability;
- The formation of the HIT Policy committee and the HIT Standards committee to provide recommendations to the ONC;
- Financial incentives for eligible professionals and eligible hospitals who adopt, implement or upgrade to a certified Electronic Health Record (EHR);
- Patients or a designated third party have the opportunity to access their electronic Personal Health Information (ePHI) upon request.

¹⁴ <http://argonautwiki.hl7.org>

¹⁵ <https://smarthealthit.org>

¹⁶ <https://bluebutton.cms.gov>

¹⁷ <https://www.apple.com/ios/health/>

¹⁸ <https://www.carinalliance.com>

¹⁹ <http://www.hl7.org/about/davinci/>

²⁰ <http://projectpoplin.org>

²¹ <http://standardhealthrecord.org>

²² American Recovery and Reinvestment Act, Pub. L. No. 111-5, 123 Stat. 115. (2009)

Electronic Health Record - Meaningful Use (EHR-MU) was presented as an approach to ensure that EHRs provided health information exchange to improve the quality of care, engage families, improve care coordination, improve population health, and provide adequate privacy and security for Personal Health Information (PHI). There were three defined stages for meaningful use:

Stage 1: Eligible Professionals and Eligible Hospitals were required to select a certain number of objectives and measures from a menu set. Objectives included items such as Computerized Physician Order Entry (CPOE), E-prescribing, drug-drug and drug-allergy checks, recording demographics, recording smoking status, maintaining an active medication list, recording and charting vital signs, incorporate clinical lab test results as structured data, medication reconciliation and summary of care record for each transition of care/ referrals, among others.

Stage 2: This stage leveraged most of the same core objectives as stage 1, but with higher thresholds for meeting objectives and additional criteria. New core objectives required Eligible Professionals (EPs) to use secure electronic messaging to communicate with patients and for patients to possess the ability to view online, download and transmit their health information within four business days of the information being available. Hospitals were required to automatically track medications from order to administration using assistive technologies in conjunction with the electronic Medication Administration Record (eMAR) and provide patients the ability to view online, download and transmit their health information within 36 hours of discharge from the hospital. This stage also attempted to place an emphasis on health information exchange by defining one core objective as providing a summary of care record for more than 50% of transitions care and referrals. Additionally, for more than 10% of transitions and referrals, a summary of care record had to be provided electronically.

Stage 3: The Health Information Exchange Objective in this stage required Eligible Professionals and Eligible Hospitals participating in this program to meet three specific measures, and meet thresholds for at least two of those measures.

- 1) For more than 50 percent of transitions of care and referrals, the EP, eligible hospital or Critical Access Hospital (CAH) that transitions or refers a patient to another setting of care or provider of care must create a summary of care record using CEHRT and electronically exchange the summary of care record.
- 2) For more than 40 percent of transitions or referrals received and patient encounters in which the provider has never before encountered the patient, the EP, eligible hospital or CAH must incorporate into the patient's EHR an electronic summary of care document.
- 3) For more than 80 percent of transitions or referrals received and patient encounters in which the provider has never before encountered the patient, the EP, eligible hospital, or CAH must perform a clinical information reconciliation.

Although the summary of care documents were transmitted using the Consolidated Clinical Document Architecture (C-CDA), the receiving provider was not required to *receive* information in C-CDA. Eligible hospitals and eligible providers were still able to count the transition if the C-CDA was converted into a Portable Document Format (PDF) or fax by the receiving provider.

A.1.2 Affordable Care Act

The Patient Protection and Affordable Care Act (ACA) of 2010²³ was designed to be a comprehensive law that would provide affordable healthcare through health insurance market reforms and improvements in healthcare coverage. In addition, it outlined amendments to the Social Security Act to improve the quality and efficiency of healthcare. Again, this act excluded PAC from any type of financial incentives. The ACA mandated:

- The establishment of the Center for Medicare and Medicaid Innovation (CMMI) to test models that would increase healthcare quality and/ or lower costs
- The creation of the Medicare Shared Savings Program (MSSP) for groups of providers and services that work together to manage and coordinate care through an Accountable Care Organization (ACO), thus promoting accountability for the patient population and encouraging investment in infrastructure
- The development of national standards for the collection of specific demographic data with interoperability and security systems for data management.

A.1.3 IMPACT Act

The Social Security Act was amended by adding the Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014²⁴ to require the use of standardized Post-Acute Care (PAC) data for quality, payment, and discharge planning. The act required:

- Reporting of standardized patient assessment data through commonly used PAC assessment instruments for Long-Term Care Hospitals (LTCHs), Skilled Nursing Facilities (SNFs), Home Health Agencies (HHAs), and Inpatient Rehabilitation Facilities (IRFs), and that failure to report data would lead to a 2% reduction in their Annual Payment Update (APU)
- Implementation of specified clinical assessment domains using standardized data elements to be nested within the assessment instruments currently required for submission by LTCH, IRF, SNF, and HHA providers
- Data to be standardized and interoperable to allow exchange of data between PAC providers, among others, using common standards and definitions to provide access to longitudinal information and facilitate coordinated care.

A.1.4 MACRA

The Medicare Access and CHIP Reauthorization Act (MACRA) of 2015²⁵ replaced the Sustainable Growth Rate (SGR) with a new system that based payment on quality and effectiveness of care. Hospitals and PACs were excluded from this system. The Act introduced:

- The Merit-based Incentive Payments System (MIPS), which reimburses eligible professionals (including physicians, physician assistants, nurse practitioners, clinical nurse specialists, and certified registered nurse anesthetists, but excluding most

²³ Patient Protection and Affordable Care Act, Pub. L. No. 111-148, 124 Stat. 119 (2010)

²⁴ Improving Medicare Post-Acute Care Transformation Act, Pub. L. No. 113-185, 128 Stat. 1952 (2014)

²⁵ Medicare Access and CHIP Reauthorization Act, Pub. L. No. 114-10, 129 Stat. 87 (2015)

Alternative Payment Model (APM) participants) based on quality, resource use, clinical practice improvement and meaningful use of certified EHRs

- Financial incentives for eligible professionals who participate in APMs and the opportunity to qualify as an advanced APM and receive a 5% bonus payment. One of the qualifiers for becoming an advanced APM is that the eligible clinician must use Certified EHR Technology (CEHRT).

A.1.5 21st Century Cures Act

The 21st Century Cures Act of 2016²⁶ focused on several key areas with one area specifically addressing the advancement of Health Information Technology (HIT) standards. It required:

- Developers of HIT, for their HIT to be certified, must meet certain requirements, including that the developer not engage in information blocking, which is preventing, discouraging, or interfering with the access, exchange, or use of information
- ONC to convene stakeholders to develop or support a framework and agreement for the secure exchange of health information between networks
- HHS to encourage partnerships between HIEs and others to offer patients access to their electronic health information.

A.1.6 CMS and ONC Interoperability Rules

In August 2018, CMS displayed the FY 2019 Inpatient Prospective Payment System (IPPS) / LTCH Final Rule²⁷ establishing new and revised requirements for eligible professionals, eligible hospitals, and critical care hospitals under the Promoting Interoperability program (previously known as the Medicare and Medicaid EHR Incentive programs). The rule finalized a new performance-based scoring system for the Promoting Interoperability program, which aimed to decrease burden on providers. In addition, it removed measures that did not emphasize interoperability and required all eligible hospitals and critical care hospitals under the Promoting Interoperability programs to use the 2015 Edition of CEHRT.

In February 2019, CMS displayed the Notice of Proposed Rulemaking (NPRM) to Improve the Interoperability of Health Information, which includes proposed policies to facilitate:

- Patient Access to their claims and clinical information through Application Programming Interfaces (APIs)
- Health Information Exchange and Care Coordination Across Payers
- API Access to Published Provider Directory Data
- Care Coordination Through Trusted Exchange Networks
- Improving the Dual Eligible Experience by Increasing Frequency of Federal- State Data Exchanges

²⁶ 21st Century Cures Act, Pub. L. No. 114-255, 130 Stat. 1033 (2016)

²⁷ FY 2019 Inpatient Prospective Payment System and Long-Term Care Hospital Prospective Payment System, 83 Fed. Reg. 41144 (August 17, 2018), available at <http://www.federalregister.com/Browse/Document/usa/na/fr/2018/8/17/2018-16766>

- Public Reporting and Prevention of Information Blocking
- Provider Digital Contact Information
- Revisions to the Conditions of Participation (CoPs) for Hospitals and Critical Access Hospitals
- Advancing Interoperability in Innovative Models
- Request for Information (RFI) for PAC providers to provide feedback

Also in February 2019, ONC proposed the Interoperability, Information Blocking, and Health IT Certification Program Proposed Rule to meet provisions of the 21st Century Cures Act, which emphasizes conditions and requirements for HIT certifications and activities to prevent information blocking. In addition, ONC released two documents in January 2018: (1) The Trusted Exchange Framework and Common Agreement (TEFCA),²⁸ which outlined a set of principles and agreements to achieving health information exchange nationwide; and (2) U.S. Core Data for Interoperability (USCDI),²⁹ which builds upon the Common Clinical Data Set (CCDS) required by ONC's 2015 Certification criteria. The additional data classes in the USCDI include clinical notes and provenance.³⁰

Neither the CMS nor the ONC rules specifically apply to PAC, but both rules include RFIs for PAC providers to solicit feedback on future policy considerations.

A.2 Current PAC Assessment Data Architecture

Several technical and policy elements exist today to facilitate the collection and evaluation of PAC assessment data.

A.2.1 Assessment Tools

As part of the implementation of the IMPACT Act, PAC providers are required to report quality measures through four CMS assessments that are used in PAC settings to collect patient assessment data including the:

- 1) Minimum Data Set (MDS) used by SNFs
- 2) Inpatient Rehabilitation Facility – Patient Assessment Information (IRF – PAI) used by IRFs
- 3) LTCH Continuity Assessment Record and Evaluation (CARE) Data Set used by LTCHs
- 4) Outcome and Assessment Information Set (OASIS) used by HHAs

Required assessment content includes standardized questions and response options (aka “data elements”) for assessing a patient’s functional status, cognitive function/ mental status, special services/ treatments/ interventions, medical conditions/ co-morbidities and impairments. The

²⁸ The Office of the National Coordinator for Health Information Technology, *Draft Trusted Exchange Framework* (January 5, 2018), at <https://www.healthit.gov/sites/default/files/draft-trusted-exchange-framework.pdf> (January 15, 2019).

²⁹ The Office of the National Coordinator for Health Information Technology, *Draft U.S. Core Data for Interoperability (USCDI) and Proposed Expansion Process* (January 5, 2018), at <https://www.healthit.gov/sites/default/files/draft-uscdi.pdf> (January 15, 2019).

³⁰ “Provenance” is an audit trail of data used to identify the source.

CMS Data Element Library (DEL) is the centralized resource for CMS assessment instrument data elements (e.g. questions and responses) and their associated health information technology (IT) standards. The goal of the publicly facing DEL is to promote sharing of CMS assessment data elements to advance HIT interoperability and improve communication and care coordination across providers, patients and families.

Although hospice is considered a PAC setting, there are no IMPACT Act requirements to submit standardized patient assessment data to CMS for hospice. However, the ACA did authorize the HHS secretary to establish a hospice quality reporting program in which the Medicare certified agencies would need to submit data on quality measures. The Hospice Item Set (HIS)³¹ is used by hospice providers to submit patient data to CMS for quality measurement

Patient data, collected via the CMS assessments for all PAC settings are submitted to the CMS QIES system, where it is used for quality measurement, payment, survey and certification, public reporting, and other CMS and provider activities. The QIES system is discussed in the next section.

A.2.2 QIES / iQIES

Post-acute care providers are required to submit patient data via the CMS assessments to the CMS Quality Improvement and Evaluation System (QIES) Assessment Submission and Processing (ASAP) system. Data can be submitted using CMS' free Java based software or vendor provided software. Once the file is submitted to the QIES ASAP system, a series of validation checks are performed to verify that the data submitted meets the required data specifications and then it is stored in the QIES National Database. In contrast, hospitals and eligible providers enter data into Certified Electronic Health Record Technology (CEHRT) software, which produces Quality Reporting Document Architecture files (QRDA).³² Data is then submitted using CMS portals.

QIES will begin transitioning to the Internet Quality Improvement and Evaluation System (iQIES) in 2019. The iQIES system will provide Application Programming Interface (API) access, with a user centric design. The iQIES functionality is decomposed into microservices that can be maintained, deployed and scaled independently, which increases application agility, availability, and scalability.³³

iQIES follows an API-first strategy to provide standard API-based access to other integrating systems.

A.2.3 EHR Usage by Post-Acute Care Facilities

Despite the exclusion of PAC facilities from EHR incentive programs, EHR adoption has been relatively high. A data brief by the ONC released in November 2018 reported as of 2017, 78% of HHAs and 66% of SNFs had adopted EHRs. Further, 20% of HHAs and 8% of SNFs used multiple methods of electronic health exchange, which included EHR, Health Information

³¹ <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Hospice-Quality-Reporting/Hospice-Item-Set-HIS.html>

³² <https://ecqi.healthit.gov/qrda-quality-reporting-document-architecture>

³³ <http://www.ahfsa.org/resources/Documents/CMS%20General%20Presentation-David%209-26-18.pptx>

Organization (HIO) and read only access.³⁴ Comparatively, in 2017, 96% of non-federal acute care hospitals possessed certified health IT.³⁵ This difference is largely attributable to the previously articulated financial incentives offered under various legislative initiatives to promote EHR adoption among eligible hospitals.

A.2.4 Role of Vendors in Post-Acute Care

PAC providers often do not have the development resources to build interoperable HIT systems, so most rely on vendors to provide that functionality.

A.2.5 Lessons Learned from the FHIR Prototype

In FY 2018, MITRE developed prototype source definitions for a set of FHIR profiles that describe how to use FHIR to convey the CMS Data Element Library (DEL) patient assessment information defined by the IMPACT Act. The proof-of-concept prototype demonstrated that the DEL patient assessment information could be fully described by a generated FHIR Implementation Guide (IG), through FHIR profiles and extensions. The success of the prototype could inform future efforts defining FHIR IGs for all PAC data that would also harmonize with other interoperability initiatives across the healthcare spectrum, including acute and ambulatory care.

A.3 Strategy

The strategy to achieve PAC interoperability in pursuit of IMPACT Act objectives³⁶ is to articulate a clear vision, break any barriers to interoperability, establish standard APIs between health systems, prioritize the most common and expensive sequences of care, and identify opportunities to improve transitions of care.

A.3.1 CMS Vision

Administrator Verma has articulated a strong vision for an interoperable health system and has pledged to break any barriers to interoperability.^{37 38} She envisions a system where health data flows freely, EHRs allow third-party applications to access data, and faxing will be eliminated from physician offices by 2020. She has expressed commitment for requiring providers to seek 2015-edition-certified EHRs that support open APIs. Open, standard APIs allow IT systems to exchange data in a meaningful way, including smartphones, wearable devices, telehealth, and devices.

³⁴ <https://www.healthit.gov/sites/default/files/page/2018-11/Electronic-Health-Record-Adoption-and-Interoperability-among-U.S.-Skilled-Nursing-Facilities-and-Home-Health-Agencies-in-2017.pdf>

³⁵ <https://dashboard.healthit.gov/quickstats/pages/certified-electronic-health-record-technology-in-hospitals.php>

³⁶ <https://www.cms.gov/Outreach-and-Education/Outreach/NPC/Downloads/2016-02-04-IMPACTAct-Presentation.pdf>

³⁷ <https://www.cms.gov/newsroom/press-releases/speech-remarks-cms-administrator-seema-verma-himss18-conference>

³⁸ <https://www.cms.gov/newsroom/press-releases/speech-remarks-administrator-seema-verma-onc-interoperability-forum-washington-dc>

A.3.2 Common Sequences of Care

Historically, HIT has focused largely on the acute or outpatient settings, but a significant proportion of Medicare beneficiaries will transition through different settings and levels of care. According to an analysis of Medicare claims in 2014, 45% of Medicare beneficiaries required post-acute care services. In this specific analysis, the most common transition after a hospitalization was to an HHA. The second most common transition was from a SNF to an HHA.³⁹

An analysis of PAC stays in 2013 conducted by the Urban Institute for Medicare Payment Advisory Commission (MedPAC) reported that the most common PAC sequence was a single HHA episode and the second most common sequence was a single SNF episode. Although this analysis looked only at PAC-related episodes and sequences, it does highlight that HHA and SNFs are the most-utilized services. Therefore, hospitalizations were not part of the sequence.⁴⁰

A.3.3 Opportunities for Improvement in Transitions of Care

Poor quality discharge information is a major barrier to safe and effective transitions.⁴¹ With a large proportion of Medicare beneficiaries requiring PAC after hospitalization, the need for a seamless exchange of health information is great. Lack of standardization in transitions of care means that information is exchanged in multiple ways, often leading to inefficient workflows, administrative burden, and increased risk of patient harm attributable to missing or inaccurate information. Due to interoperability challenges, providers are not receiving complete and accurate information in a timely manner, leading to patient harm, particularly with regard to medication reconciliation. One report suggested that of all the medication reconciliation errors that were reported during an 11-month period, 22% occurred during the patient's admission to the facility and 66% occurred during a patient's transfer to another level of care,⁴² demonstrating significant opportunities for improvement in transitions of care.

³⁹ RTI International analysis of 2014 Medicare claims under contract with the Assistant secretary for Planning and Evaluation, August 2018 (aea0315).

⁴⁰ http://www.medpac.gov/docs/default-source/contractor-reports/sept2018_pac_sequence_of_care_w_cov_contractor_sec.pdf

⁴¹ King, B. J., Gilmore-Bykovskiy, A. L., Roiland, R. A., Polnaszek, B. E., Bowers, B. J., & Kind, A. J. (2013). The consequences of poor communication during transitions from hospital to skilled nursing facility: a qualitative study. *Journal of the American Geriatrics Society*, 61(7), 1095-102

⁴² Santell, John P. *Joint Commission Journal on Quality and Patient Safety*, Volume 32, Issue 4, 225 - 229

Appendix B. Discussion Topics

B.1 PAC IT Vendor Discussion Topics

Discussions with PAC vendors covered the following topics:

- 1) Tell us about your products and how they support PAC facilities / organizations.
- 2) What are your most common use cases?
- 3) Who are your primary customers?
- 4) What do you see as your customer's biggest challenges today? 1 year from now? In 5 years?
- 5) What type of feedback have you received from customers about your product?
- 6) Do any of your products interact with other health IT systems or patient mobile apps?
- 7) Do you consider CMS policies as part of your routine business activities?
- 8) How do you incorporate CMS assessments in your systems?
- 9) Do you have a strategic roadmap to promote interoperability? What role would you like CMS to play?
- 10) What version of C-CDA do you support? What do you think of FHIR? How do you plan to use C-CDA and FHIR in the future?
- 11) Do your products have the capability to share information with HIEs? Which ones?
- 12) If you were King or Queen for a day, what would you do to improve health data interoperability?

B.2 PAC Provider Discussion Topics

Discussions with PAC providers covered the following topics:

- 1) On average, how many and type of patients/residents do you serve in a calendar year?
- 2) Does your facility / organization use an EHR system? Is it certified? How do you use it?
- 3) If you do not use an EHR system, why not? What are the barriers?
- 4) Do you use health IT products that would not be considered an EHR (for example, mobile devices, mobile applications, telehealth devices)?
- 5) Are you familiar with CMS PAC assessments, Data Element Library (DEL), QIES?
- 6) What process or system do you currently use to transfer healthcare information for providers and patients?
- 7) Do you have a strategic roadmap to promote interoperability? What do you think of FHIR? What role would you like CMS to play?
- 8) If you were King or Queen for a day, what would you do to improve health data interoperability?

Appendix C. Discussion List

The discussions conducted during the interoperability landscape analysis are listed in Table 4.

Table 4. Discussion List

Organization	Participants	Date
AllScripts	Debbie McKay – Sr. Solutions Manager, Regulatory Dhawal Kapadia – Senior Manager Emma Jones – Expert Clinical / Business Analyst.	December 21, 2018
APTA	Matt Elrod – Associate Director, Department of Practice	December 3, 2018
CIMPAR	Raj Mahajan – President and CEO	December 18, 2018
Chesapeake Regional Information System for our Patients (CRISP)	Michael Berger – CIO	December 19, 2018
Epic	Sasha TerMaat – Director	November 15, 2018
Ethica Health & Retirement Communities	Mark Pavlovich – Director of Analytics	December 4, 2018
Homecare Homebase	Neil Reizer – VP of Product Development	November 6, 2018
Kno2	Terasa Bell – President and CTO Steve Williams – VP of Product Alan Swenson – VP of Interoperability	November 13, 2018
LeadingAge	Majd Alwan – SVP for Technology and Executive Director of CAST at LeadingAge	November 13, 2018 November 29, 2018
LivPact	Carey Ussery – CEO and founder	November 9, 2018
MatrixCare	Larry Wolf – Chief Transformation Officer	November 30, 2018
NASL	Donna Doneski – Director of Policy and Membership	November 5, 2018 November 16, 2018
Netsmart	Hannah Patterson – Director of Product Management, PAC Record and her	November 30, 2018
Pharmacy HIT Collaborative	Shelly Spiro – Executive Director	November 9, 2018
Pharmacy Quality Alliance	Lisa Hines – Sr. Director, Measure Operation Laura Cranston – Pharmacist	December 7, 2018

Organization	Participants	Date
Philips Wellcentive	Greg Fulton – Policy Lead Jennifer Spreg – Development and Platform Lead	November 16, 2018
PointClickCare	Genice Hornberger – Sr. Product Manager Pam Campbell – Product Owner, Regulatory B.J. Boyle – Director of Product Management, Interoperability	January 8, 2019
Sutter Health	Steven Lane, MD – Family MD and Informaticist	November 16, 2018

Appendix D. List of DEL TAG Participants

Table 5. List of DEL TAG Participants

Organization	Participants
Cognitive Medical Systems, Inc; HL7	Julia Skapik – CHIO
CRISP	Michael Berger – CIO
EMI Advisors LLC	Evelyn Gallego – CEO
GEHRIMED	Adam Young
Ingleside Engaged Living	Dusanka Delovska-Trajkova – CIO
Kno2	Alan Swenson – VP of Interoperability
Leading Age	Majd Alwan – SVP for Technology and Executive Director of CAST at LeadingAge
Leavitt Partners	Ryan Howells – Principal
MatrixCare	Doc Devore – Director, Enterprise Interoperability
MedAllies	Holly Miller – Chief Medical Officer
Medisolv	Zahid Butt – CEO
NASL	Donna Doneski – Director of Policy and Membership
Partners Healthcare	Terrence O'Malley , Medical Director
Phillips Population Health Management	Jennifer Sprague – Solutions Leader
Rocky Mountain Care	Pete Zeigler – VP of Quality and Innovation
Trinity Rehab Services	Robert Latz – CIO

Acronyms

Acronym	Definition
ACA	Affordable Care Act
ACO	Accountable Care Organization
ADT	Admission Discharge Transfer
ALF	Assisted Living Facility
API	Application Programming Interface
APM	Alternative Payment Model
APU	Annual Payment Update
ARRA	American Recovery and Reinvestment Act of 2009
ASAP	Assessment Submission and Processing
C-CDA	Consolidated Clinical Document Architecture
CAMH	CMS Alliance to Modernize Healthcare
CAH	Critical Access Hospital
CARE	Continuity Assessment Record and Evaluation
CCDS	Common Clinical Data Set
CCRC	Continuing Care Retirement Communities
CDS	Clinical Decision Support
CEHRT	Certified Electronic Health Record Technology
CIO	Chief Information Officer
CMIO	Chief Medical Information Officer
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
CRISP	Chesapeake Regional Information System for our Patients
CTO	Chief Technology Officer
DCPAC	Division of Chronic and Post-Acute Care
DEL	Data Element Library
eCQI	Electronic Clinical Quality Improvement
eCQM	Electronic Clinical Quality Measures
EHR	Electronic Health Record
eMAR	Electronic Medication Administration Record

Acronym	Definition
EP	Eligible Professional
ePHI	Electronic Personal Health Information
FFRDC	Federally Funded Research and Development Center
FHIR	Fast Healthcare Interoperability Resources
HHHA	Home Health Agency
HHS	Department of Health and Human Services
HIE	Health Information Exchange
HIMSS	Healthcare Information Management and Systems Society
HIS	Hospice Item Set
HIT	Health Information Technology
HITECH	Health Information Technology for Economic and Clinical Health Act of 2009, part of the American Reinvestment and Recovery Act of 2009
HITWG	Health Information Technology Working Group
HL7	Health Level Seven International (healthcare standards organization)
HTTP	Hypertext Transfer Protocol
IMPACT	Improving Medicare Post-Acute Care Transformation Act of 2014
IPPS	Inpatient Prospective Payment System
iQIES	Internet Quality Improvement and Evaluation System
IRF	Inpatient Rehabilitation Facility
IT	Information Technology
LOINC	Logical Observation Identifiers Names and Codes
LTCH	Long-Term Care Hospital
LTPAC	Long-Term Post-Acute Care
MACRA	Medicare Access and CHIP Reauthorization Act of 2015
MedPAC	Medicare Payment
MD	Medical Doctor
MDS	Minimum Data Set
MIPS	Merit-based Incentive Payments System
MSSP	Medicare Shared Savings Program
MU	Meaningful Use
OASIS	Outcome and Assessment Information Set
OAuth	Open Authorization

Acronym	Definition
ONC	Office of the National Coordinator
PAC	Post-Acute Care
PAI	Patient Assessment Information
PDF	Portable Document Format
PDPM	Patient-Driven Payment Model
PHI	Personal Health Information
QIES	Quality Improvement and Evaluation System
QPP	Quality Payment Program
QRDA	Quality Reporting Document Architecture
QRP	Quality Reporting Program
REST	Representational State Transfer
RN	Registered Nurse
RUG	Resource Utilization Group
SGR	Sustainable Growth Rate
SMART	Substitutable Medical Apps, Reusable Technology
SNF	Skilled Nursing Facility
SNOMED	Systematized Nomenclature of Medicine
SPADE	Standardized Patient Assessment Data Elements
TEFCA	Trusted Exchange Framework and Common Agreement
USCDI	United States Core Data for Interoperability
VA	Department of Veterans Affairs
VSAC	Value Set Authority Center