HL7 Version 3 Domain Analysis Model:
Care Plan, Release 1
May 2016

HL7 Informative Document

Sponsored by:
Patient Care Workgroup

Additional Interested Work Group Name:
Structured Document Workgroup
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<tr>
<th>Terminology</th>
<th>Owner/Contact</th>
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</thead>
<tbody>
<tr>
<td>Current Procedures Terminus (CPT) code set</td>
<td>American Medical Association</td>
</tr>
<tr>
<td>SNOMED CT</td>
<td>International Healthcare Terminology Standards Developing Organization (IHTSDO) <a href="http://www.ihtsdo.org/snomed-ct/get-snomed-ct">http://www.ihtsdo.org/snomed-ct/get-snomed-ct</a> or <a href="mailto:info@ihtsdo.org">info@ihtsdo.org</a></td>
</tr>
<tr>
<td>Logical Observation Identifiers Names &amp; Codes (LOINC)</td>
<td>Regenstrief Institute</td>
</tr>
<tr>
<td>International Classification of Diseases (ICD) codes</td>
<td>World Health Organization (WHO)</td>
</tr>
<tr>
<td>NUCC Health Care Provider Taxonomy code set</td>
<td>American Medical Association. Please see 222.nucc.org. AMA licensing contact: 312-464-5022 (AMA IP services)</td>
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<td>Date</td>
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<td>October 2014 - April 2016</td>
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<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Contents</td>
</tr>
<tr>
<td></td>
<td>1.1 Table of Contents</td>
</tr>
<tr>
<td>2.1</td>
<td>Project Coordinator and Document Editor</td>
</tr>
<tr>
<td>2.2</td>
<td>Collaborators and Contributors</td>
</tr>
<tr>
<td>2.3</td>
<td>Project Sponsor</td>
</tr>
<tr>
<td>3</td>
<td>EXECUTIVE SUMMARY</td>
</tr>
<tr>
<td>3.1</td>
<td>Project Overview</td>
</tr>
<tr>
<td>3.2</td>
<td>DAM Overview</td>
</tr>
<tr>
<td>3.3</td>
<td>Ballot Scope</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Out of Scope for this Ballot</td>
</tr>
<tr>
<td>3.4</td>
<td>Target Audience of the CP DAM</td>
</tr>
<tr>
<td>3.5</td>
<td>Introduction</td>
</tr>
<tr>
<td>3.6</td>
<td>Background</td>
</tr>
<tr>
<td>3.6.1</td>
<td>Significant Terms</td>
</tr>
<tr>
<td>3.6.2</td>
<td>Dynamic vs. Static Care Plan</td>
</tr>
<tr>
<td>3.6.3</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>3.7</td>
<td>Project Goals</td>
</tr>
<tr>
<td>3.8</td>
<td>Assumptions</td>
</tr>
<tr>
<td>3.9</td>
<td>Out of Scope</td>
</tr>
<tr>
<td>4</td>
<td>Care Plan DOMAIN ANALYSIS MODEL ARTIFACTS</td>
</tr>
<tr>
<td>4.1</td>
<td>Storyboards</td>
</tr>
<tr>
<td>4.2</td>
<td>Storyboard Elements</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Participant Information for Storyboards</td>
</tr>
<tr>
<td>4.3</td>
<td>Storyboard 1: Chronic Conditions</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Short Description of the health issue thread covered in the storyboard</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Encounter A: Primary Care Physician Initial Visit</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Encounter B: Allied Health Care Provider Visits</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Encounter C: Hospital Admission</td>
</tr>
<tr>
<td>4.3.5</td>
<td>Encounter D: Primary Care Follow-up Visits</td>
</tr>
<tr>
<td>5</td>
<td>Care Plan Models</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5.1</td>
<td>UML Notation Used in the Models</td>
</tr>
<tr>
<td>5.2</td>
<td>Care Plan Conceptual Model</td>
</tr>
<tr>
<td>5.3</td>
<td>Care Plan Organizing Framework for Coordination of Care Models</td>
</tr>
<tr>
<td>5.4</td>
<td>Care Plan Logical Information Model</td>
</tr>
<tr>
<td>5.5</td>
<td>Care Plan Process Model</td>
</tr>
<tr>
<td>5.5.1</td>
<td>Coordination of Care Model</td>
</tr>
<tr>
<td>5.5.2</td>
<td>High Level Care Plan Development</td>
</tr>
<tr>
<td>5.6</td>
<td>Requirements</td>
</tr>
<tr>
<td>5.7</td>
<td>Intended Implementation</td>
</tr>
<tr>
<td>5.8</td>
<td>Risks to Implementation</td>
</tr>
<tr>
<td>6</td>
<td>APPENDICES</td>
</tr>
<tr>
<td>6.1</td>
<td>Appendix 1: Example Relevant Quality Data Model Definitions</td>
</tr>
<tr>
<td>6.2</td>
<td>Appendix 2: International Care Plan Structures Comparison</td>
</tr>
<tr>
<td>6.3</td>
<td>Appendix 3: Additional Storyboards</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Storyboard 2: Acute Care</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Storyboard 3: Home Care</td>
</tr>
<tr>
<td>6.3.3</td>
<td>Storyboard 4: Pediatric Allergy</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Storyboard 5: Pediatric Immunization</td>
</tr>
<tr>
<td>6.3.5</td>
<td>Storyboard 6 – Perinatology</td>
</tr>
<tr>
<td>6.3.6</td>
<td>Storyboard 7 – Stay Healthy/Health Promotion</td>
</tr>
<tr>
<td>6.3.7</td>
<td>Storyboard 8 – Case Management/Disease Management Care Coordination</td>
</tr>
</tbody>
</table>
## 1.1 Project Coordinator and Document Editor

Laura Heermann Langford RN, PhD  
Stephen Chu, MD, PhD  
Enrique Meneses

## 1.2 Collaborators and Contributors

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Elaine Ayers, MS, RD</td>
<td></td>
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<tr>
<td>Andre' Boudreau</td>
<td></td>
</tr>
<tr>
<td>Emma Jones, RN, MS, PhD</td>
<td></td>
</tr>
<tr>
<td>Gaye Dolin RN, MS</td>
<td></td>
</tr>
<tr>
<td>Denise Downing, RN MS</td>
<td></td>
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<tr>
<td>Jon Farmer</td>
<td></td>
</tr>
<tr>
<td>Sarah Gaunt</td>
<td></td>
</tr>
<tr>
<td>Leslie Hall</td>
<td></td>
</tr>
<tr>
<td>Lindsey Hoggle, MS, RD, PMP</td>
<td></td>
</tr>
<tr>
<td>Lenel James</td>
<td></td>
</tr>
<tr>
<td>Susan Campbell, RN</td>
<td></td>
</tr>
<tr>
<td>Rosemary Kennedy, RN, PhD</td>
<td></td>
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<tr>
<td>Russell Leftwich, MD</td>
<td></td>
</tr>
<tr>
<td>Terry Meredith</td>
<td></td>
</tr>
<tr>
<td>Lisa R Nelson, MS, MBA</td>
<td></td>
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<tr>
<td>Gordy Raup</td>
<td></td>
</tr>
<tr>
<td>Carolyn Silzie, MS, RD</td>
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<tr>
<td>Ray Simkus</td>
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<tr>
<td>Dave Stumpf, MD</td>
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<tr>
<td>Iona Thraen, MSW</td>
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<td>IHE Patient Care Coordination Technical Committee</td>
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## 1.3 Project Sponsor

HL7 Patient Care Work Group
2 EXECUTIVE SUMMARY

2.1 Project Overview

The scope of this project is to create a Domain Analyses Model (DAM) as a common reference artefact to support the development of implementable care plan models. The care plan is a tool used by clinicians to plan and coordinate care for an individual patient. The care plan is known by several similar and often interchangeable names such as the plan of care and treatment plan. It is acknowledged that the use of these similar names and their associated meanings are context, organization and realm specific. The Care Plan DAM uses the concept care plan in the generic sense. This project encompasses several years of discussion and work within the HL7 Patient Care Work Group in collaboration with several other teams to produce artifacts defining requirements, information models, contextual storyboards and definitions of terms that collectively articulate the care planning processes and care plan structure. One of the key objectives is to produce a care plan model and associated infrastructure robust enough to support the design and implementation of the variety of care plans known to this project.

The care plan is a highly discussed (and at times debated) topic in many healthcare venues throughout the world. Identification of what is needed within the care plan for coordination of care and healthcare delivery in general is needed. There is strong support from multiple stakeholders throughout the healthcare arena to define a domain analysis model (including the information model) for the care plan within HL7 as quickly as possible.

The care plan topic can be mapped to the Care Provision Domain Message Information Model (D-MIM) and the care plan D-MIM, which is a specialization of the Care Statement with a focus on defined guideline based care Acts. The transformation of those Acts occurs when the selected Acts are added within an individualized care plan.

The purpose of the care plan as defined upon acceptance of the DSTU materials in 2007 is:

- Define the management action plans for the various conditions (for example problems, diagnosis, health concerns) identified for the target of care
- Organize a care plan and check for completion by all individual professions and/or responsible parties (including the patient, caregiver or family) for decision making, communication, and continuity and coordination
- Communicate explicitly by documenting and planning actions and goals
- Permit the monitoring, flagging, evaluating and feedback of the status of goals, actions, and outcomes such as completed, or unperformed activities and unmet goals and/or unmet outcomes for later follow up.
- Manage risk related to effectuating the care plan,

Generally, a care plan greatly aids the care team in planning, understanding and coordinating the actions that need to be performed for the target of care.

The care plan structure is used to define the goals and management of activities for the various conditions identified for the patient, or recipient of care provided. It is the structure in which the care planning by all individual professions or groups of professionals can be organized, planned and checked for completion. Communicating explicitly documented goals and planned actions greatly aids the patient, their caregivers and the interdisciplinary team (including patients, providers, nurses, therapists, dietitians, case managers and disease managers) in understanding and coordinating the actions that need to be performed for the person. Care plans also permit the monitoring and flagging of unperformed activities and unmet goals for follow up.

The artifacts contained within this Care Plan DAM articulate best practice of the care plan as discussed in the HL7 Patient Care Workgroup, Care Plan Initiative. These discussions have been in close concert with...
discussions occurring within the HL7 SOA Workgroup Care Coordination Service project, The HL7 Structured Documents Workgroup Care Plan Implementation Guide project, the ONC S&I Framework Longitudinal Coordination of Care (LCC) Community led initiative and the IHE Patient Care Technical Committee Patient Centered Care Plan (PtCP) Profile project. The intention is to be collaborative, synergistic and supportive with each of these named efforts and projects.

2.2 DAM Overview

This project provides guidance for the HL7 community and beyond on definitions of terms related to the “care plan”, contextual applications of the care plan through storyboards, and an overview that outlines the information needs of care plans. This Care Plan Domain Analysis Model (CP DAM) contains a broad spectrum of storyboards intended to describe the multiple settings and/or venues of care where care planning occurs and a care plan artifact exists. The CP DAM contains an information model created in tandem with the HL7 Service Oriented Architecture Workgroup. The CP DAM also includes a short list of functional requirements supporting the creation, use, storage and exchange of the care plan as well as a glossary clarifying use of the terms within this CP DAM.

2.3 Ballot Scope

The Care Plan DAM ballot is limited to the contents contained within this document. There may be some overlap with other balloted documents within HL7 (such as the Care Coordination Service Functional Model and Profiles or the Consolidated CDA Templates for Clinical Note, DSTU R2 (C-CDA R2)) Efforts have been made to maximize synergy between these balloted documents, minimize extent of overlap and to reference those relevant resources where appropriate. This CP DAM contains artifacts meant to be supportive and not antagonistic to these other efforts.

2.3.1 Out of Scope for this Ballot

The domain surrounding the care plan is quite large and complex. The areas below are recognized to be an important part of the care plan domain but are not included in this ballot document. It is anticipated these areas will be addressed in subsequent versions and ballot documents of this CP DAM.

2.3.1.1 Orders and Scheduling

Orders and scheduling are related to the execution of the care plan and execution of the care plan is out of scope for this domain analysis model. The Care Plan model has structure (Plan Activity) to support the expression and the intent of orders. Actual placement of orders however are through computerized provider order entry (CPOE) and not represented in this work.

Further discussion is needed to define how orders in care plan are instantiated as order sets. It is noted order sets are not care plans. Order sets are created for certain health conditions to realize certain goals. Order sets can be the results of a computerized decision support system and can be incorporated into a care plan. However, additional work is needed to identify what order sets need to include to support care plans. Collaboration with the CDS team is needed to determine standards for order sets incorporated into the CP DAM.

2.3.1.2 Reconciliation
A key component of clinical workflow is the ability to reconcile clinical data. Reconciliation of electronic clinical information from multiple data sources is a difficult task. It involves managing large amounts of clinical information that are often larger than most people can keep in working memory. When static care plans are exchanged reconciliation of two or more care plans must be considered. Content areas such as health problems/concerns (which include allergies/intolerances), goals and interventions (which include medications) might need reconciling. The CP DAM does not currently address reconciliation of the care plan.

Synchronization and reconciliation of multiple care plans is addressed in the HL7 Care Coordination Services (CCS) functional model and capabilities co-authored by the HL7 Services Oriented Architecture and HL7 Patient Care Working Group. The storyboards that depict the reconciliation and synchronization process are in the CCS document.

2.3.1.3 Quality Measures

Measuring and monitoring the impact care plans have on patient care outcomes is very important. The application and relationship of the CP DAM artifacts to the Quality Data Model (QDM), Quality Reporting Document Architecture (QRDA), Health Quality Measure Format (HQMF) has not yet been addressed. An initial activity needing attention is the harmonization of terms and definitions used within the CP DAM with the QDM definitions of similar terms. An example of the QDM term definitions is in Appendix 1.

Exploratory discussions between PCWG and CQI workgroup on how quality measures metrics can be reflected in care plan instantiation and implementation began at the September 2103 Workgroup meeting. Initial analysis of the care plan structure appears to indicate that structural components of the care plan model is capable of supporting implementation of quality metrics. CQI plans to supply use cases, storyboards and sample quality metrics for further validation of the care plan model. Collaborations with CQI are continuing.

2.3.1.4 Application of Care Plan to Populations and Public Health

The application of care plan to a population for public health purposes has not yet been discussed. It is conceivable the artifacts described in the CP DAM could apply to the overall care of populations and public health concerns. The appropriateness of this application and the adaptations needed to the model have not yet been addressed. An initial evaluation to determine the interest and need for this application also needs to be completed.

2.3.1.5 Terminology Binding

Terminology bindings are not included as part of the Domain Analysis Model. This work will be done and available with the implementable model design. Works on high priority value sets for both using in C-CDA R2.x conformant care plan CDA documents and Fast Healthcare Interoperable Resources (FHIR) care plan resource are scheduled to commence in July 2015.

2.4 Target Audience of the CP DAM

The CP DAM informs all stakeholders interested in the care planning information space. This includes the stakeholders listed in Table 2 of this document, but the HL7 domain analysis tool is specifically focused towards those interested in the HL7 Standards space including but not limited to:

- Developers of specifications that incorporate the care plan in other specifications to understand the context, uses and information needs of the care plan.
2.5 Introduction

The provision of healthcare today often encompasses multiple disciplines that may be spread across several settings and sites of care. Coordinating the care provided and received from all settings/venues of care and team members can be challenging. It is not uncommon for miscommunication and/or errors or omissions in care to occur. Care plan has been accepted as one of the effective tool to foster cross care team communications and care coordination. Care plans can enhance understanding of other clinicians and patients for acute, short-term and chronic, long term conditions by enabling greater patient engagement and shared decision-making.

The term “care plan” is often used interchangeably with “plan of care”, “treatment plan” or other similar terms. The content and use of the “care plan” is not consistent and may often mean different things to different people. The Care Plan DAM recognizes the current practice to label artifacts serving as care planning tools with adjectives describing the scope of the plan. As such, the concept “care plan” is used in a generic sense without any attempt to exert differentiation between the different types of plan that are used and understood in varying ways by stakeholders based on the contexts and scope of use. Examples of these are Cardiovascular Plan of Care, Home Health Care Plan, Diabetes Management Plan, and Interdisciplinary Care Plan.

The care plan model defined in this Care Plan DAM includes structural components sufficient for accommodating the implementation of different types of care plans that fit these descriptive titles to allow the greatest utility in all care situations.

The care plan is widely acknowledged to be an effective tool for coordinating delivery of integrated care to patient with chronic conditions. Chronic diseases are diseases that are persistent and can have long-term effects. “Chronic” is usually applied to diseases lasting over 3 months. Individuals of all ages are living longer with chronic illness and disability. The World Health Organization\(^1\) estimates 63% of all annual deaths (~36 million people) are attributable to non-communicable or chronic diseases. As the number and complexity of health conditions increase and episodes of acute illness are superimposed, the number of care providers contributing to individual care often increases. With this complexity, it becomes significantly more difficult to align and coordinate care among diverse providers who frequently span multiple sites.

The numbers of health care service delivery encounters required by individuals, as well as the failure to deliver and coordinate needed services are significant sources of frustration and errors. These issues are drivers of health care expenditures. According to claims data reported for US Medicare beneficiaries in 2003-2004, 19.6% of re-hospitalizations occurred 30 days after discharge. This translated into $17.4 billion dollars in hospital payments from Medicare in 2004\(^2\). Providing person-centered care is particularly important for medically-complex and/or functionally impaired individuals given the complexity, range, and
on-going and evolving nature of their health status and the services needed. Effective, collaborative partnerships between service providers and individuals are necessary to ensure that individuals have the ability to participate in planning their care and that their wants, needs, and preferences are respected in health care decision making.

Efficient health information exchange to support coordination of care across multiple clinicians and care sites requires more than medication reconciliation and care summary exchanges. The availability and adoption of standards to support and inform care delivery independent of care setting is essential to alleviating fragmented, duplicative and costly care.

The Care Plan DAM supports the creation of interoperable care plans necessary for any process that is developed to reconcile or harmonize conflicting plans relating to a single individual. Without a process to reconcile potentially conflicting plans created by multiple providers, it is difficult, if not impossible to avoid unnecessary and potentially harmful interventions. Without such a process, it is also difficult to shift the perspective of providers from the management of currently active issues to consideration of future goals and expectations. Similarly, the challenge of establishing a consensus driven process across multiple disciplines and settings is confounded by a fragmented system of policies, technologies and services.

As information moves across settings through the longitudinal care space, care team members need more information than standard chart summaries typically provide. Care team members, including patients, benefit from sharing comprehensive patient data and information, including the care plan.

There is growing recognition of the need for and benefits of fully interoperable Health Information Technology (HIT) capabilities across care provider groups. Of importance are the information or data needs of the medically complex and/or functionally impaired individuals. Effective, collaborative partnerships among service providers and individuals are necessary to ensure that individuals have the ability to participate in planning their care and that their wants, needs, and preferences are respected in health care decision making. The identification and harmonization of standards for the longitudinal coordination of care will improve efficiencies and promote collaboration by:

- Improving provider’s workflow by enabling secure, single-point data entry for data related to care coordination
- Eliminating the large amount of time wasted in phone communication and the frustrations on the side of the receiving provider in not always obtaining care transition and care planning information in a timely manner
- Reducing paper and fax, and corresponding manual processes during care coordination
- Supporting the timely transmission of relevant clinical information at each point of care transition and as the patient's condition changes
- Enabling sending and receiving provider groups to initiate and/or recommend changes to patient interventions more promptly
- Exchange of interoperable plans

This care plan DAM is intended to support an evolving care model based on interdisciplinary patient-centric care and delivery. It is recognized the use of care plans is currently highly varied with some organizations and clinical settings (e.g. cancer treatment centers, home health, emergency departments, trauma centers, labor and delivery) providing clinical care with comprehensive interdisciplinary patient-

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centric care plans. While other settings use multiple tools (templates, protocols, care pathways, ordersets) which are highly specialized to unique care areas. These tools are often called “care plans” even though they usually lack patient specific content such as patient goals, preferences, barriers to care, a care team roster and other common features of a care plan as specified in the care plan DAM. These highly specialized tool are also often used without regard to overlap or discrepancy to other care settings or disciplines engaged in the patient’s care. The terms care plan and plan of care are used in different contexts with different meaning. Such terms are often used in specific clinical domains or settings to refer to the care plan for an individual in that context, and even when interdisciplinary, do not necessarily represent all of the care or all of the care providers for that individual. This care plan DAM acknowledges and sets the foundation for consolidating these specialized templates, protocols, pathways and ordersets into integrated interdisciplinary patient centric plans supporting coordinated care and delivery.

### 2.6 Background

The care plan as a tool representing one or more health issues/problems, goals and a set of planned care activities is traditionally known to be a piece of that is updated or replaced when either a patient's condition changes, or according to rules or regulations. Efforts have been made to make the care plan accessible to users of the EHR resulting in multiple proprietary electronic formats. The application of the term “care plan”, “plan of care” or “treatment plan” to these paper based tools has been somewhat arbitrary. There is a basic idea of what may be found under these headings, but there is no consistency from site to site or care giver to care giver.

Different disciplines apply the terms care plan, plan of care and treatment plan differently. Some include “care plan sections” within other notes, such as a discharge summary, while others have complete documents, sometimes many pages with the title of the document being “care plan”. Each of these methods has a specific purpose that is necessary. It is not the position of this CP DAM to endorse one method over another. The CP DAM is to look at care planning information needs in a broad way and articulate requirements and an information model that supports the many methods of care planning and the variety of stakeholders.

Recently the topic of care plan and care coordination has become a focus of several national and international discussions. In the US the ONC Standards & Interoperability Framework has addressed the use of care plan and care plan components in both the Transition of Care and Longitudinal Care Coordination Initiatives, the National Quality Forum has sponsored Technical Expert Panels and the development of quality measures related to care plan. The Patient Care Coordination Committees at IHE (Integrating the Healthcare Enterprise) and multiple workgroups at HL7 have all had projects related to defining care plan elements and promoting interoperability of the artifacts. This CP DAM committee has worked diligently to share, collaborate and coordinate this effort with the efforts these other organizations to remain closely aligned. Although impossible to maintain complete agreement it is a shared goal of all interested parties to share and cross pollinate between the efforts towards a more cohesive and aligned vision and direction.

The Care Plan DAM approaches the definition of care plan from a functionally driven perspective. The CP DAM defines a care plan as a planning and coordination tool to assist in delivery of integrated/collaborative care by a health care team within which the patient is the center of the team. A care plan supports the inclusion of health concerns and risks, health goals, care preferences and barriers, interventions, and iterative reviews during the planning and implementation phases of collaborative care. The care plan also supports communication of the whole, or parts of the plan, acceptance (or not) of the plan, and synchronization or reconciliation of multiple plans.

### 2.6.1 Significant Terms

The United States Office of the National Coordinator (ONC) S&I Framework Longitudinal Care Coordination (LCC) Community Initiative has defined care plan, plan of care and treatment plan as...
distinctly unique but related entities. In the course of developing the CP DAM the HL7 Patient Care
Workgroup spent significant time internally and reaching out to other interested parties, intensely
researching, discussing and debating the definition of these three terms. Over time, the PCWG team
acknowledged the concepts have been, and will continue to be used interchangeably or somewhat
differently. The legacy of these terms is deeply entrenched in clinical and/or business uses by multiple
stakeholders. They are likely to continue to be understood and used in different ways depending on the
preference, culture, experiences, context of use, and funding models under which they operate. It is
recognized that changing this deeply rooted cultural interchangeability of the terms is beyond the scope of
this Domain Analysis Model. The Care Plan DAM will use the concept “care plan” in the generic sense.
The key objective of the project is to ensure that the care plan model and its accompanying
infrastructures are fully capable of supporting the different uses and can be labeled accordingly in care
planning, care coordination and care plan sharing activities.

As these definitions continue to be included in the artifacts of the ONC S&I Framework the HL7 Care Plan
DAM will monitor the evolution of the term usage and if appropriate revisit the inclusion of the definitions
at another time.

2.6.2 Dynamic vs. Static Care Plan

While the CP DAM is limited in scope and does not address processes associated with care planning, it
does recognize the difference between static care planning and dynamic care planning. While all care
planning could be considered dynamic and constantly changing, the CP DAM recognizes the power of
computers allowing the care plan to be managed in ways not possible with paper or plans in non-
interoperable electronic format.

Figure 1 illustrates a collaborative care model where the care plan is dynamically updated and maintained
by multiple organizations and providers. The central gray box indicates a future state of a federated care
plan existing in a cloud-like architecture. While not currently supported through available Clinical
Information Systems and security structures, thought leaders in care coordination envision this as an
ultimate tool in flexibility, accuracy and accessibility of all information needed by patients and care team
members to obtain the highest quality of care at the lowest cost. The diagram is included here to give
insight to a potential path the care plan may have. This line of thinking was considered when developing
the care plan information model. The diagram is representative and not intended to be all inclusive or
exhaustive of all care settings, care processes, or stakeholders that may be involved in care coordination.
It is envisioned that dynamic care plans related to the care of a patient are developed, shared, actioned and revised in real-time by participating care providers via a collaborative care plan management environment supported by complex workflow management tools. Dynamic care plans should be organic. They may be coordinated by a care coordinator if needed, or self-governed by all team members. Ultimately the dynamic care plan contains links to relevant patient information (where appropriate and feasible, i.e. privacy and security permit), and other supportive tools such as evidence-based resources, and real time quality dashboards with outcome data.

Limitations in information system architecture, and healthcare cultural issues such as who “owns” the care plan, how items are added, deleted updated etc. makes the near term implementation and use of dynamic care plans unlikely. As dynamic care plans are currently not entirely supported for all care settings, it is realized a more supportable and realistic model for care plans is data and information that can be exchanged across care settings. Static exchanged care plans are essentially a snap shot of the patient’s master care plan at a point in time. They are usually communicated after an episode of care often together with referral/request for services to target care providers. A static exchanged care plan is helpful in communicating relevant care plan information to other care team members, but it is recognized in complex cases with multiple care team members it may be “out-dated” as soon as it is created. Updating static exchanged care plans is dependent on human intervention, typically the next care team member assuming coordination of care for the patient. This method may overlook minor updates or changes by other team members participating in the care of the patient.
## 2.6.3 Stakeholders

The ONC S&I Framework Community Initiative has identified Communities of Interest who are public and private stakeholders directly involved in the business process, in the development and use, and/or in actual implementation of care plans. Communities of Interest may directly participate in the exchange of care plans; that is, they are business actors or are affected indirectly through the results of the improved business process.

The ONC S&I Framework Longitudinal Care Coordination (LCC) community of interest and their definitions were included in the first Care Plan DAM informative ballot. The contents have generated extensive debates. A compromised approach was decided — that modifications would be applied to contents to reflect ballot comments dispositions, but also to preserve as closely as possible the original ONC LCC contents.

Table 1 is the list of Communities of Interest and their definitions as defined by the ONC S&I Framework LCC Community. Please note that recommended edits from CP DAM ballot comment disposition are included via cross outs, parenthesis and italics. It is not intended for these definitions to be recognized as official HL7 definitions. They are included here to enhance the discussion of the CP DAM. HL7 PCWG is not taking defining the process or entities involved in care planning at this time.

<table>
<thead>
<tr>
<th>Member of Communities of Interest</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>Member of the public who requires healthcare services from acute care and ambulatory facilities, emergency department, Physician’s office, and/or the public health agency/department and LTPAC sites of care.</td>
</tr>
<tr>
<td>Consumer</td>
<td>Member of the public that includes a patient as well a caregiver, patient advocate, surrogate, family member, and other party who may be acting for, or in support of, a patient receiving or potentially receiving healthcare services.</td>
</tr>
</tbody>
</table>
| Care Coordinator / Care Manager   | Individual who supports a patient and/or other consumer by coordinating with clinicians in the management of health and disease conditions, physical, cognitive functioning, psychosocial aspects of care, and issues related to health and human services. This includes case manager and others.  

*The role is not necessarily a job title but a functional role. In some cases, a high functioning patient or family member may serve this role. The data needs of the role are the same regardless who is filling it.* |
<p>| Caregiver                         | A caregiver typically focuses on helping the patient carry out Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs). The caregiver can also assist the patient in carrying out medication self-administration and/or treatments intended to help heal or palliate health condition(s) and convey information about the patient’s response to the care plan to the providers and relevant parties. This individual may be authorized by the patient to receive Personal Health Information (PHI) that is used to inform the type, methods, and frequency of care activities provided in the home in keeping with the patient’s wishes and/or directions. |
| Surrogate                         | Individual designated as a legal default decision-maker or health care proxy or agent for the patient when the patient is unable to make decisions or speak for himself or herself about personal health care. This individual may be selected by the patient and/or patient’s caregiver or family members. |</p>
<table>
<thead>
<tr>
<th><strong>In some cases, the surrogate may be a defacto individual without a formal “designation”</strong>.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinician</strong></td>
</tr>
<tr>
<td><strong>Laboratory</strong></td>
</tr>
</tbody>
</table>
| **Pharmacist/Pharmacy** | An expert on medication therapy and is the primary health professional that optimizes medication use to provide patients with positive health outcomes.  

*In the US system, a typical retail pharmacist/pharmacy does not routinely play this role.* |
| **Care Team Member** | Party who manages and/or provides care or service as specified and agreed to in the care plan, including clinicians, other paid and informal caregivers, communication sponsor and the patient. Note: In some settings the Care Team is a separate group of people whose responsibility it is to formalize a care plan and possibly even to implement or coordinate its implementation. This group of people may or may not include any or all members of the patient’s rendering team of healthcare professionals. Members of the Care Team are typically selected because of their availability and their having a role, which may include specialized training and/or licensure, that meets the care needs of the individual.  

*comprehensive knowledge of the patient’s condition(s) and/or due to their knowledge of the healthcare business rules governing aspects of patient care or its financing.* For this reason, the term Care Team is capitalized to indicate the specific group of individuals who create the content of the structured document referred to as care plan.  

*The care team may be selected by the PCP, the patient, the family, or may grow organically in the course of the patient’s care.* |
<p>| <strong>Provider</strong> | Provider of medical or health services and any other person or organization who furnishes, bills, or is paid for health care in the normal course of business. This includes a licensed/certified and/or credentialed person who provides health and/or human (ancillary care) services, who is authorized to implement a portion of the care plan and who has patient care responsibilities (e.g., physicians, advanced practice nurses, physician assistants, nurses, nurse care managers, psychologists, therapists, pharmacists, dietitians, |</p>
<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accountable Care Organizations, Patient Centered Medical Home etc.</td>
<td>This also includes organizations including, but not limited to hospitals including short-term acute care hospitals and specialty hospitals (e.g., long-term care hospitals, rehabilitation facilities, and psychiatric hospitals, Accountable Care Organizations, Patient Centered Medical Home, etc.), ambulatory centers, provider practices, nursing facilities, home health providers, home and community-based service providers (e.g., home-based care, hospice, adult daycare centers, etc.), and human and social service providers (e.g., behavioral health, transportation, etc.).</td>
</tr>
<tr>
<td>Healthcare Payer</td>
<td>Any private or public entity that finances health care delivery or organizes health financing. This includes commercial for-profit health insurers, non-profit health insurers, ERISA self-insured, state and federal department agencies that oversee Medicaid and Medicare health services delivery. The payer can be actively involved with the member to influence cost effective evidenced based outcomes.</td>
</tr>
<tr>
<td>Healthcare Administrator and Manager</td>
<td>Individual with patient information and medical records management responsibilities including Health Information Management (HIM) personnel, Registered Health Information Administrator (RHIA), Registered Health Information Technicians (RHIT), Inpatient/Outpatient Clinical Coding Specialists, Medical Transcription Specialists, Medical Records Safety and Security staff, Quality Assurance and Improvement personnel, Physician Practice Managers, Pharmacy Benefit Managers, Nurse Discharge Planner, Nurse Care Manager, and other management personnel or entities involved in managing patient information.</td>
</tr>
<tr>
<td>Agent (Clearing Houses and other entities as defined by Health Insurance Portability and Accountability Act (HIPAA) including Health Information Handlers)</td>
<td>Any organization that handles health information on behalf of a provider as a covered entity or under a Business Associate Agreement (BAA). Many providers already use Agents to submit claims, provide electronic health record systems, etc. Organizations that are Agents include but are not limited to Claim Clearinghouses, Release of Information vendors, Health Information Exchanges, Electronic Health Record vendors, etc.</td>
</tr>
<tr>
<td>EHR/PHR and HISR Vendor</td>
<td>Entity that provides specific EHR/PHR solutions to clinicians such as software applications and software services. These suppliers may include developers, service providers, resellers, operators, and others who may provide these or similar capabilities.</td>
</tr>
<tr>
<td>Other Healthcare Vendor</td>
<td>Vendor that provides health care solutions other than EHR/Electronic Medical Record (EMR)/Personal Health Record (PHR) solutions such as software applications and services. Examples include integration vendors, data providers, medical device vendors, Remote Monitoring Management System (RMMS) vendors, diagnostic imaging service providers, clinical order system supply vendors, transcription service vendors,</td>
</tr>
</tbody>
</table>
clearinghouses, drug knowledge suppliers, network infrastructure providers, Clinical Decision Support (CDS) resource systems, practice-based registry system suppliers, public health registry systems, immunization information system providers, clinical genetic database/repository system vendors, practice management systems, care management/disease management system vendors, and patient accounting systems, etc.

<table>
<thead>
<tr>
<th>Health Information Exchange/Health Information Organization (HIE/HIO)</th>
<th>Organization dedicated to the mobilization of healthcare information electronically across organizations within a region, community or hospital system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Extension Center (REC)</td>
<td>Entity that supports and serves health care providers to help them quickly become adept and meaningful users of EHRs. RECs provide training and support services to assist doctors and other providers in adopting EHRs, offer information and guidance to help with EHR implementation, and give technical assistance as needed. Originally sponsored through ONC REC Grant Program.</td>
</tr>
<tr>
<td>Standards Development Organization (SDO)</td>
<td>Organization whose purpose is to define, harmonize and integrate standards that will meet clinical and business needs for sharing information among organizations and systems.</td>
</tr>
<tr>
<td>Federal Agency</td>
<td>Organization within the federal government that delivers, regulates or provides funding for health care, long-term care, and/or human services.</td>
</tr>
</tbody>
</table>

Table 1. List of Stakeholders

The CP DAM project team emphasizes patients and their designees (family care givers and others) must be included in care plan design. The National Partnership for Women and Families and other consumer advocates have provided guidance and policy support to ONC emphasizing this need. (http://www.nationalpartnership.org/research-library/health-care/HIT/consumer-principles-for-1.pdf). Care plans used in the provider, payer and population health arenas benefit when patients provide their goals of care, preferences for treatment, decisions, medications taken, home observations, home based results (like device data) and care support changes (i.e. rides to care, care giver access). Shared decision making with patients will result in better care plans. As recently demonstrated in the Health Story project, care plans can begin with the patient preference and direction even in the most acute treatment. (http://www.himss.org/health-story-project). Dependence on this information source as clinical only, further disintermediates the patient from the care process and leaves opportunities for efficiency, engagement and accuracy to be ignored. As a foundation to care planning the patient/designee should be incorporated within and harmonized with other efforts for patient generated data.

2.7 Project Goals

The goal of this CP DAM is to create a platform for discussion of terms and artifacts related to care coordination. There is a desire for a common understanding of terminology and artifacts created by, stored, used, and updated during care coordination, however the long history of various applications of similar terms and artifacts is recognized. Effort has been made to discover, discuss and articulate an information model that is flexible to meet needs of today as well as a vision for the future. Effort has been
made to collaborate with other interested parties from many international venues and to incorporate the latest thinking towards meeting the needs of care coordination. This CP DAM is a first attempt at articulating the domain of the care plan. It is expected to generate more discussion and evolve over time.

An additional goal for the CP DAM was to create a model for a generic care plan concept applicable for use in all care plan needs of various detail and scope. Using this model for all care plan needs such as Physical Therapy Treatment Plan for Fall Prevention, Nutrition Treatment Plan for Pressure Ulcer Management, Invasive Line Treatment Plan for Catheter Related Infection Prevention, Cardiovascular Plan of Care, Diabetes Care Management Plan, and Comprehensive Patient Care Plan allows for interoperability, reconciliation/synchronization and greater care collaboration.

2.8 Assumptions

The CP DAM assumes the care team is actively involved in creating, updating and using the care plan includes the patient of focus for the care plan, any family or community care givers, and all disciplines of professional and semi-professional caregivers such as physicians, nurses, therapists, nutritionists, nursing and medical assistants etc.

2.9 Out of Scope

The CP DAM is limited to articulating the data and information used to create, store, access, update and use a care plan. The process surrounding care planning is not fully addressed or articulated in this CP DAM. The storyboards are provided as examples of the context in which the care plan is used. These are not intended to promote a specific care planning process.
3 CARE PLAN DOMAIN ANALYSIS MODEL ARTIFACTS

3.1 Storyboards

Storyboards are narrative descriptions of clinical scenarios where the care plan is created, accessed, updated or used during the provision of healthcare. Storyboards provide context to the information collected, retrieved, presented and reported in care plans.

The topics of storyboards contained in this CPDAM are intended to describe a limited variety of care settings and criticality of care where care plans are applied. It is recognized it is not feasible to adequately represent all applications of the information model described in this document. One storyboard is used in the main text of the document for demonstration purposes. Other storyboards are included in the appendix of this document to further illustrate the application and use of the care plan. The storyboards included in this document do not, in anyway, indicate a priority, preference or value placement to those care areas, care settings, or specific application of the CPDAM or the information model therein. The application of the CPDAM and the information model described could be infinitesimal as needed by specific care coordination needs.

3.2 Storyboard Elements

**Short Description** - typically a brief statement that conveys the role and purpose of the specific use case.

**Actors and Roles**—individuals who initiate an action that requires the system to respond

**Pre-Conditions**—document the business or system states that are necessary prior to the storyboard encounter

**Description of Encounter**—the primary path and tasks performed between the actors or the system

**Post-Conditions**—describe the potential states after the encounter

3.2.1 Participant Information for Storyboards

The Care Plan DAM uses the HL7 defined participant roles and patient types.

Care management across the continuum of care is an emerging process that crosses organizational boundaries, care provision domains and healthcare sectors including but not limited to patients, clinical providers, healthcare systems (both inpatient and outpatient, physical and behavioral health, social care and community care) and payers (private insurers, governmental payers, private pay and self-insured employers). As a result of such complexity, describing a shared care plan that meets all of the needs of the various entities in the form of a storyboard is not feasible at this time. The Care Plan DAM in its current form is an initial attempt to identify common functions across these varying actors and is in no means a final stopping point. In fact, this is the first of several iterations expected to occur as users of this beginning framework identify its strengths, weaknesses, needs for expansion and opportunities for improvement. We invite all who review this and the ongoing versions to consider it critically and to
provide feedback to the Patient Care Plan Work group for improvements. Appendix 3 contains several examples of use cases in storyboard form that have been reviewed for purposes of informing this current version. Not every functionality has been incorporated into these storyboards as the Patient Care Work Group recognizes the need for diversity in the application of the care plan model. As experience with the model grows, new versions will incorporate common elements needed to make the shared care plan a vital and robust tool for providing care across the continuum of care.

## 3.3 Storyboard 1: Chronic Conditions

### 3.3.1 Short Description of the health issue thread covered in the storyboard

The purpose of the chronic conditions care plan storyboard is to illustrate the communication flow and documentation of a care plan between a patient, his or her primary care provider and the home health specialists involved in the discovery and treatment of a case of Type II Diabetes Mellitus. This health issue thread (simplified) consists of four encounters, although in reality there could be many more encounters:

- A. Primary Care Physician Initial Visit
- B. Allied Health Care Provider Visits
- C. Hospital Admission
- D. Primary Care Follow-up Visits

Care coordination should occur throughout the health issue thread, across several care settings and several care providers/givers. It is briefly discussed later in this document, after the series of encounters.

### 3.3.1.1 Storyboard Actors and Roles

- Primary Care Physician: Dr. Patricia Primary
- Patient: Mr. Bob Anyman
- Diabetic Educator: Ms. Edith Teaching
- Dietitian/Nutritionist: Ms. Debbie Nutrition
- Exercise Physiologist: Mr. Ed Active
- Optometrist: Mr. Victor Vision
- Pharmacist: Ms. Susan Script
- Podiatrist: Mr. Barry Bunion
- Psychologist: Mr. Larry Listener
- Hospital Attending Physician: Dr. Allen Attend

### 3.3.2 Encounter A: Primary Care Physician Initial Visit

#### 3.3.2.1 Pre-conditions

Patient Mr. Bob Anyman attends his primary care physician (PCP) clinic because he has been feeling generally unwell in the past 7-8 months. His recent blood test results reveal abnormal glucose challenge test profile.

#### 3.3.2.2 Description of Encounter

Dr. Patricia Primary reviews Mr. Anyman’s medical history, presenting complaints and the oral glucose tolerance test results and concludes the patient suffers from Type II Diabetes Mellitus (Type II DM). Dr.
Primary accesses Mr. Anyman’s medical record, and records the clinical assessment findings and the diagnosis.

Dr. Primary discusses with Mr. Anyman the identified problems, potential risks, goals, management strategies and intended outcomes. After ensuring that these are understood by the patient, Dr. Primary begins to draw up a customized chronic condition (Type II DM) care plan based on a standardized multi-disciplinary Type II DM care plan adopted for use by her practice. Agreed goals and scheduled activities specific for the care of Mr. Anyman are entered into the new care plan.

Dr. Primary also discusses with the patient the importance of good nutrition and medication management and exercise in achieving good control of the disease, as well as the criticality of good skin/foot care and eye care to prevent complications. Scheduling of consultations with diabetic educator, dietitian, exercise physiologist, community pharmacist, optometrist, and podiatrist (allied health care providers) is discussed and agreed to by the patient. The frequency of visit to allied health care providers is scheduled according to the national professional recommendation for collaborative diabetes care.

Dr. Primary also notices signs and symptoms of mood changes in the patient after the diagnosis is made. She recommends that the patient may benefit from seeing a clinical psychologist to which the patient also agrees.

Dr. Primary generates a set of referrals to these allied health care providers. The referrals contain information about the patient’s medical history including the recent diagnosis of Type II diabetes, reasons for referral, requested services and supporting clinical information such as any relevant clinical assessment findings including test results. A copy of the care plan agreed to by the patient is attached to the referral.

### 3.3.2.3 Post Condition

Once the care plan is completed, it is committed to the patient’s medical record. The patient is offered a copy of the plan.

A number of referrals in the form of notification/request for services together with a copy of the care plan are sent to the relevant health care providers.

The patient is advised to follow the referral practice/protocol specific to the local health care system or insurance plan. For the first appointment, the patient may wait for scheduled appointments from the relevant health care providers to whom referral/request for services have been sent, or may be able to schedule his own appointment using booking systems of the specialist or allied health providers.

### 3.3.3 Encounter B: Allied Health Care Provider Visits

#### 3.3.3.1 Pre-Condition

Mr. Anyman’s allied health care provider has received a referral with copy of care plan from Dr. Patricia Primary.

The allied health care provider has accepted the referral and scheduled a first visit with the patient – Mr. Bob Anyman.

The case has been assigned to the following individual allied health care providers:

A. Ms. Edith Teaching (Diabetic Educator) for development and implementation of comprehensive diabetic education program and plan to ensure that the patient understands the nature of the disease, the problem, potential complications and how best to manage the condition and prevention of potential complications
B. Ms. Debbie Nutrition (Dietitian/Nutritionist) for development and implementation of a nutrition care plan for diabetes to ensure effective stabilization of the blood glucose level with the help of effective diet control.

C. Mr. Ed Active (Exercise Physiologist) for development and implementation of an exercise regime.

D. In certain countries (e.g. Australia), the community pharmacist (Ms. Susan Script) provides patient with education on diabetic medications prescribed for the patient by Dr. Primary, and development and implementation of an effective and safe medication management program. The objectives are to gain and maintain effective control of the condition and to prevent hypo- and hyper-glycemic episodes.

E. Mr. Larry Listener (clinical psychologist) for counseling and to develop and implement an emotional support program; this includes a plan to reduce the impact of emotional stress brought about by the newly diagnosed condition and to improve the patient’s psychological well-being. The plan may include enrolling patient in diabetic support group.

F. Mr. Victor Vision (Optometrist) for regular (e.g. 6 monthly) visual and retinal screening and to educate patient on the eye care and how best to prevent/minimize the risks of ocular complications.

G. Mr. Barry Bunion (Podiatrist) for education on the risks of foot complications and to develop and implement an effective foot care program including regular self-assessment, care of the feet and follow-up visits.

3.3.3.2 Description of Allied Health Care Provider Encounter

The patient is registered at the allied health care provider’s reception. Any additional or new information provided by the patient is recorded in the health care record system operated by the allied health provider clinic.

During the first consultation, the allied health care provider reviews the referral and care plan sent by Dr. Primary.

During subsequent consultation, the allied health care provider reviews the patient’s health care record and most recent care plan of the patient kept in the allied health care provider care record system.

At each consultation, the allied health care provider reviews the patient’s health record, assesses the patient, checks the progress and any risks of non-adherence (compliance) and complications, and discusses the outcomes of the management strategies and/or risks. Any difficulties in following the management strategies or activities by the patient are discussed. Any new/revised goals and timing, new intervention and self-care activities are discussed and agreed to by the patient. The new/changed activities are scheduled and target dates agreed upon.

The allied health care provider updates the clinical notes and the care plan with the assessment details, and any changes to the management plan including new advice to the patient. The date of next visit is also determined.

<table>
<thead>
<tr>
<th>Provider / Allied Health Provider</th>
<th>Encounter Activities</th>
<th>Outcomes</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Educator</td>
<td>Review referral/patient progress</td>
<td>Develop/update education plan</td>
<td>New/updated education plan to patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Update clinical notes</td>
<td>Summary care plan and progress note to primary care</td>
</tr>
<tr>
<td>Dietitian/Nutritionist</td>
<td>Review referral/patient progress</td>
<td>Develop/update diet plan</td>
<td>New/updated care plan to patient</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------</td>
<td>--------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>Assess diet management needs and strategies</td>
<td>Weight assessment; Exercise plan</td>
<td>Summary diet plan and progress note to primary care provider and to others, e.g. diabetic educator, exercise physiologist, etc.</td>
</tr>
<tr>
<td></td>
<td>Discuss and finalize diet management plan</td>
<td>Diet management plan; Referral to educator and exercise therapy if necessary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Generate progress notes</td>
<td>Update clinical notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generate progress notes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exercise Physiologist</th>
<th>Review referral/patient progress</th>
<th>Develop/update exercise plan:</th>
<th>New/updated exercise plan to patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assess exercise/activity needs and strategies</td>
<td>Weight assessment; exercise plan</td>
<td>Summary care plan and progress note to primary care provider and to others, e.g. diabetic educator, dietitian, etc.</td>
</tr>
<tr>
<td></td>
<td>Discuss and finalize exercise plan</td>
<td>Update clinical notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Generate progress notes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community Pharmacist</th>
<th>Review patient medication profile</th>
<th>Develop/update medication management plan:</th>
<th>New/updated medication management plan to patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assess medication management (education, conformance, etc.) needs and strategies</td>
<td>patient current medication list assessment result; recommendation on meds management; referral to other provider(s) if necessary</td>
<td>Summary care plan and progress note to primary care provider and to others, e.g. diabetic educator, dietitian, etc.</td>
</tr>
<tr>
<td></td>
<td>Discuss and finalize medication management plan</td>
<td>dispense record on dispensed meds</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Update clinical notes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generate progress notes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Psychologist</th>
<th>Review referral/patient progress</th>
<th>Develop/update psychological management plan:</th>
<th>New/updated psychological management plan to patient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assess emotional status, coping</td>
<td></td>
<td>Summary care plan and progress note to primary care</td>
</tr>
<tr>
<td><strong>Optometrist</strong></td>
<td><strong>Podiatrist</strong></td>
<td><strong>Table 2. Allied Health Encounter – Activities and Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Review referral/patient progress</td>
<td>Review referral/patient progress</td>
<td>Develop/update foot care plan</td>
<td></td>
</tr>
<tr>
<td>Assess eye care needs and strategies</td>
<td>Assess foot care needs and strategies</td>
<td>Foot assessment</td>
<td></td>
</tr>
<tr>
<td>Discuss and finalize eye care plan</td>
<td>Discuss and finalize foot care plan</td>
<td>Foot care plan</td>
<td></td>
</tr>
<tr>
<td>Emotion assessment; Psychotherapy session plan</td>
<td>Update clinical notes</td>
<td>Update clinical notes</td>
<td></td>
</tr>
<tr>
<td>Update clinical notes</td>
<td>Generate progress notes</td>
<td>Generate progress notes</td>
<td></td>
</tr>
<tr>
<td>provider and to others, e.g. diabetic educator, pharmacist, etc.</td>
<td>New/updated eye care plan to patient</td>
<td>New/updated foot care plan to patient</td>
<td></td>
</tr>
<tr>
<td>Stop smoking (prevent smoking related damage to eye cells)</td>
<td>Summary care plan and progress note to primary care provider and to others, e.g. diabetic educator, pharmacist, etc.</td>
<td>Summary care plan and progress note to primary care provider and to others, e.g. diabetic educator, dietitian, pharmacist, etc.</td>
<td></td>
</tr>
<tr>
<td>Wear sun glasses when in sun (prevent UV accelerating eye damage) – dispense prescription sun glasses if necessary;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referral to Dietitian/Nutritionist for counseling on diet rich in fruits and green leafy veg and Omega 3 fats along with effective weight control</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Update clinical notes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Generate progress notes</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**mechanisms and strategies**

Discuss and finalize psychological management plan

**Optometrist**

- Review referral/patient progress
- Assess eye care needs and strategies
- Discuss and finalize eye care plan

**Activity**

- Develop/update eye care plan:
  - Regular eye checks for early detection of Diabetic retinopathy (1 yearly to 2 yearly depending on national protocol and how advanced is DM)
  - Stop smoking (prevent smoking related damage to eye cells)
  - Wear sun glasses when in sun (prevent UV accelerating eye damage) – dispense prescription sun glasses if necessary;
  - Referral to Dietitian/Nutritionist for counseling on diet rich in fruits and green leafy veg and Omega 3 fats along with effective weight control

**Outcome**

- Update clinical notes
- Generate progress notes

**Podiatrist**

- Review referral/patient progress
- Assess foot care needs and strategies
- Discuss and finalize foot care plan

**Activity**

- Develop/update foot care plan
  - Foot assessment
  - Foot care plan

**Outcome**

- Update clinical notes
- Generate progress notes

**Summary**

- New/updated eye care plan to patient
- Summary care plan and progress note to primary care provider and to others, e.g. diabetic educator, pharmacist, etc.
### 3.3.3.3 Post Condition

An updated allied health domain specific care plan complete with action items and target dates is completed with patient agreement.

The patient is given a copy of the new/updated care plan at the end of each allied health consultation.

At the end of each consultation a progress note is written by the allied health provider which documents the outcomes of the assessment, any new risks identified and changes to or new management strategies that have been included in the updated care plan. This allied health domain specific progress note is sent to the patient’s primary care provider, Dr. Primary. Any care coordination responsibilities required of Dr. Primary is also communicated. The progress note is also sent to any other allied health care provider(s) who may need to be informed about changes in risks, goals, and management plan that are relevant to the ongoing management of the patient. For example, progress note from a dietitian/nutritionist may contain clinical information that may need to be considered by the diabetic educator.

### 3.3.4 Encounter C: Hospital Admission

#### 3.3.4.1 Pre-Condition

Mr. Bob Anyman took a 3-month holiday in Australia during the southern hemisphere spring season, missed the influenza immunization window in his northern hemisphere home country, and forgot about the immunization after he returned home. He develops a severe episode of influenza with broncho-pneumonia and very high blood glucose level (spot BSL = 23 mM) as complications. He suffers from increasing shortness of breath on a Saturday afternoon.

Mr. Anyman presents himself at the emergency department of his local hospital as Dr. Primary’s clinic is closed over the weekend.

#### 3.3.4.2 Description of Encounter

Mr. Anyman is admitted to the hospital and placed under the care of physicians from the general medicine clinical unit.

During the hospitalization, the patient is given a course of IV antibiotics, insulin injections to stabilize the blood glucose level. The patient was assessed by the hospital attending physician, Dr. Allen Attend, as medically fit for discharge after four days of inpatient care. Dr. Attend reconciles the medication treatment during inpatient care, creates a discharge medication list, outlines follow up information and discusses post discharge care with the patient. He recommends the patient to consider receiving influenza immunization before the next influenza session and updates this as recommendation to Dr. Primary in the patient’s discharge plan.

Planning for discharge is initiated by the physician and the nurse assigned to care for the patient soon after admission as per hospital discharge planning protocol. The discharge plan is finalized on the day of discharge and a discharge summary is generated.

#### 3.3.4.3 Post Condition

The patient’s discharge care plan is completed. This plan may include information on changes to medications, management recommendations to the patient’s primary care provider and the patient, and any health care services that are requested or scheduled.

The patient is given a copy of the discharge summary that includes the discharge care plan.

A discharge summary with summary of the discharge plan is sent to the patient’s primary care provider, Dr. Primary with recommendation for pre-influenza season immunization.
3.3.5 Encounter D: Primary Care Follow-up Visits

3.3.5.1 Pre-Condition

Patient Mr. Bob Anyman is scheduled for a post-hospital discharge consultation with his primary care provider, Dr. Primary

Mr. Anyman is seen by Dr. Primary at her clinic on the day of appointment.

The discharge summary information from the hospital is incorporated into the patient’s medical record and is ready for Dr. Primary to review at the consultation.

3.3.5.2 Description of Encounter

Primary Care Physician Dr. Patricia Primary reviews patient Mr. Anyman’s hospital discharge summary and discusses the pre-influenza season immunization recommendation with the patient. The patient agrees with the recommendation. The care plan is updated.

Dr. Primary notices that the patient has gained extra weight and the blood sugar level has not quite stabilised after discharge from hospital. Dr. Primary reviews the care plan and discusses with patient the plan to change the diet and medication. Patient agrees. The care plan is updated.

Dr. Primary issues a new prescription to the patient, and asks the patient to make an early appointment to see the dietitian to discuss new nutrition management strategy and plan.

Dr. Primary generates progress notes with nutrition management and exercise change recommendations are generated by Dr. Primary and sent to the patient’s dietitian. The care plan is updated and sent to relevant allied health providers

Dr. Primary changes patient’s follow-up visits from four monthly to two monthly for the next two appointments with the aim to review the follow-up frequency after that.

3.3.5.3 Post Condition

A new prescription is sent to the patient’s community pharmacy. Ms. Script will discuss the new medication management plan with the patient when he goes to pick up his medications.

The patient also makes an early appointment to see the dietitian and exercise physiologist. A copy of progress notes from Dr. Primary will be received by the dietitian and exercise physiologist before the scheduled appointment.

Patient gets a copy of the updated care plan, and a copy of the plan is also sent to relevant allied health providers.

3.3.5.4 General Observations about Coordination of Care

While patient is in hospital coordination of care would be under the responsibility of the hospital attending physician. This coordination role would then be transferred formally to the primary care physician who may work with a community care coordinator.

Coordinated care is required when a patient’s care needs are complicated such that there are multiple ongoing assessments, planning and intervention from a variety of clinical specialists. The provision of care from multiple providers must be coordinated to ensure delivery of effective and efficient quality care.
Coordinated care is a systemic approach to providing effective care and support to patients with chronic conditions. When coordinated care is implemented, patients (and their families where necessary and appropriate) are managed/cared for and supported across the health/wellness continuum. The resulting care and management are effective, efficient, high quality, accessible, and produce optimal health outcomes.
4 CARE PLAN MODELS

The Care Plan project team has developed a number of care plan model artifacts. A layered modeling approach was used which allows for separation of concerns by business requirements, information requirements and technical interoperability requirements, and to support forward and backward traceability through these layers. The model semantics are grounded on the clinical scenarios described in the care plan project storyboards and also review comments received from the care plan model team and the ONC LCC HL7 Tiger Team.

The first layer, the conceptual model level, identifies the business domain concepts and concept relationships necessary to define the scope of the domain semantics covered by the subsequent levels.

The second layer, the logical information model, elaborates the conceptual model by adding attributes necessary to capture the data elements resulting from dynamic care planning interactions and required for capturing static point in time snapshots of the care plan. At the logical information level, the model retains a one to one mapping of all the domain concepts except abstract data types such as String, Boolean and Code start to surface. The logical information model contributes intrinsic data properties necessary to specify a class model with sufficient detail to support interoperability information requirements.

In the third layer, the platform implementation model will be realized through independent technical specifications such as CCDA specification of the care plan and its exchange, dynamic care plan management system implementation, and SOA specifications for coordination of care. The logical model will be transformed into a technical specification to support message exchange and service interoperability.

The platform implementation model does not necessarily map one to one with the logical information model as engineering constraints may result in denser, terser and more optimal data structures and abstractions. To be meaningful and have utility to the business domain users the platform implementation model is still traceable to the logical information model via explicit mapping.

The layers provide different perspectives starting with the business domain semantics and ending with the technical interoperability (engineering concern) models with traceability to the storyboards and technical use cases.

The conceptual and logical information model levels will be described in the following subsections.

- Care Plan Conceptual Model
- Care Plan Organizing Framework for Coordination of Care Models
- Care Plan Logical Information Model

The Care Plan model captures the necessary details for describing and supporting a broad set of use cases encompassing dynamic use of care plans within the context of care planning and execution applications and also the exchange of point in time care plan snapshots via messages and documents.

The Care Plan structure is designed to support the implementation of different types of plans including comprehensive multidisciplinary plans as well as discipline- or treatment- specific plans. The generic “Plan” structure which together with a number of supporting components describe health concerns, health goals, interventions (plan activities), preferences, health risks, acceptance review, outcome review, care team roles, participations and their relationships.
The care plan model provides the structure to support the differentiation of these (and other) types of plan through vocabulary driven attributes and the display name attribute of the Plan class.

Information requirements and care processes discerned from the rich set of care plan storyboards have been used to validate the adequacy of the generic Plan structure and its components in supporting the implementation of the three types of Plans as defined by the LCC project.

Some important aspects of the model to keep in mind:

1. The models do not specify governance, policy and business rules but support their use by capturing the necessary content and relationships to enable many policies and governance models.

2. The model defines domain level semantics for future technical service, message and document standard specifications. Technical platform binding to services, messages and documents is out of the scope of the Care Plan DAM. Technical specifications will obtain their semantics from the Care Plan DAM.

3. The Care Plan DAM does not provide vocabulary binding but specifies coded properties which would be constrained via specific terminology bindings. Terminology bindings will be developed for downstream implementable artifacts. Coded properties within the Care Plan DAM may specify root concept hierarchies from an ontology, taxonomy or simple value set. The Care Plan DAM identifies those properties with coded representation at the information level and provides examples as enumerated values to inform analysis for terminology binding.

The Care Plan DAM is an unconstrained model of the domain information which describes the semantics necessary to support various organizational use cases and international realm perspectives. It is expected that derived models will add constraints to determine which aspects or slices of the model are sufficient for their use case; for example, Clinical Document Architecture (CDA) representation of a care plan instance does not represent dynamic care team participations as it is a point in time snapshot of the information and interactions only.

The model captures the features resulting from process interactions but does not specify or dictate what the process is; it is a domain information model. The model is agnostic to policy and business rules decisions. The model simply describes the features necessary to support diverse processes which naturally occur across continuum of care, organization and geographical boundaries. External definitions of process, policy, business rules and governance will determine what subset of features is sufficient for their implementation based on one of the technical specifications derived from the Care Plan DAM. As a principle, organizations will provide their own policies, rules and decisions and the Care Plan model will provide a vessel for holding the data necessary to support the process interactions.

A key aspect of the story boards which inform the Care Plan DAM is that the Care Plan exists in the continuum of care and changes in time and space through the interactions of a care team which includes the patient, his or her family, providers, care givers and social support structure. As such the plan emphasizes the involvement of care team members in a given role participating in documenting, managing, tracking, communicating and giving care to the patient.

In order to support future standards based coordination of care processes the interactions or participations of the care team are as important as the resulting information elements necessary for static snapshots. The Care Plan DAM captures data resulting from care team interactions in order to support dynamic and collaborative coordination of care interactions. Knowing who, when and how an individual care team member was involved in an activity helps to answer why something was done and facilitates awareness and harmonization of one shared and consistent care plan across the continuum of care.
4.1 UML Notation Used in the Models

The Care Plan model is expressed as a single UML (Unified Modeling Language) model with various class diagrams that emphasize different features and aspects of the model.

UML classes represent concepts from the domain and may and may not always map one to one to an implementable class.

The model makes use of the following UML capabilities:

- **UML Class** – Expresses a domain concept.
- **UML Property** – Represent intrinsic attributes of the concept.
- **UML Association** – Specifies a relation between concepts.
- **UML Association Class** - An association class can be seen as an association with data properties. For example, the Participation association class used in the Care Plan model specifies attributes which identify where, when and how an individual care team was involved in an occurrence of the plan, goals, concerns, interventions, etc. These attributes are part of the associative type of Participation.

![Participation Association Class Example](image)

- **UML Template** - are model elements with unbound formal parameters that you can use to define families of classifiers. In the model, these are used to represent unconstrained place holders for clinical object references. For example, the reason for a Health Concern may be a Condition, an Allergy, a Medication, etc. The unbound place holder parameter allows specifying a Health Concern pertaining to any of these disjoint concepts.

- **UML Stereotype** – Used to extend UML at the meta-level. This model uses a “<<Temporal Awareness>>” stereotype for UML associations. The “<<Temporal Awareness>>” stereotype indicates the association requires special temporal awareness by the care team (awareness of before and after values). For example, a priority attribute may be changed and the awareness of the change can be of special importance to care team decision making. The use of the stereotype in the model explicitly informs downstream artifacts that they should consider the capability to support awareness of the change through time.
4.2 Care Plan Conceptual Model

The conceptual model is designed to capture high level business requirements and delineates the scope of the domain necessary to support definition of the logical information model and derived technical interoperability standards. Its focus is to identify the necessary concepts and relationships only. The model does not specify data properties; the data properties are elaborated in the logical information model. The conceptual model establishes common semantics for concepts and relationships required to establish the scope of electronic care plan interoperability for point-in-time care plan exchanges and dynamic, shared and collaborative care plan interactions.

The conceptual model classes/concepts are directly traceable to the business requirements captured in the various storyboards included in this document.

4.2.1.1 Model Descriptions

The model consists of an abstract Plan which captures the shared components of collaborative, patient centered and holistic care. The Plan has associations to concepts for Health Concern, Health Goal, Health Risk, Care Barrier, Care Preference, Conversation, plan Activity (including interventions), Acceptance Review, Plan Review and key care team participations through time and space between the Patient, Provider(s), Care Giver(s) and other Supporting Member(s). Each is listed equally but it is the health concern, and the plan Activity that are directly driving the anticipated Health Goal (whether or not it is realistic). The Health Outcome(s) are tied to the health concern, goal and activity allowing evaluation of the progress of care towards the health goal(s).

The figure below from the HL7 CDA R2 IG: Consolidated CDA Templates for Clinical Note (US Realm), DSTU R2—Vol. 1: Intro shows key components of a care plan: health concern, health goal, intervention, evaluation/outcome, and the flow between them.

Figure 3. Care Plan Relationship Diagram
The *Plan* and many of its associated classes support dynamic care team involvement as defined by the shared characteristics inherited from the *OccurrentWithParticipation* primitive concept. Many yet unspecified process models and realm specific policies and rules will specify how *Participation* occurs. The important point is that the Care Plan DAM has the capability to capture information about these participations. As an example, dynamic care planning interactions spread through time and space and directed towards harmonization of the *Plan* will result in specific involvement of multiple care team members. Capturing the details of participations enables awareness necessary to support coordinated care via standards based applications. In the *Plan* class the careTeamInvolvement association is further specialized to indicate key constituents consisting of the *Patient, Providers, Care Givers* and other *Supporting Members*.

The details of the *Plan* result from the interactions of the *Care Team* which consists of the *Patient* and at least optional *Providers, Care Givers or Supporting Members*. The details included may come from recommendations of a specialist, the preferences of a patient, or a payer preferred pathway. A *Plan* is not intended to be static but continuously changing based on continual chatter, negotiation and interactions between the various care team members. When the *Plan* becomes static, cross care teams’ communications and care coordination will need to be managed by mechanisms outside the care plan system to prevent communication and care coordination breakdowns, information gaps and risks to care. The *Care Plan* by design is a collaborative, shared and dynamic structure with controlled *Care Team* involvement or participation.

The *Care Team* is in many places, interactions span the continuum of care and time. Resolution of differences in opinion, correction of discrepancies and overall harmonization of the care plan requires raising awareness and visibility of care team *Participations* so that they are visible to all care team members (within the constraints of the circle of care which needs to know).

A *Plan* may come into being as a result of one or more patient *Health Concerns* or simply as a result of a patient *Health Goal*. For example, in the stay healthy use case, a health care consumer may not have a specific concern but simply a desire (i.e. goal) to improve some aspect of their health. In this case the patient may have a *Plan* entirely driven by *Health Goals*. The *Plan* is created with simply a goal in mind. For patients with some health condition whether simple, chronic or complex the *Plan* will reference one or more *Health Concerns*. The *Health Concern* specifies the reason for creating the Plan. In this case the *Health Concern* reason eventually leads to the definition of *Health Goals* as a result of conversations between the patient and his or her providers, care givers and supporting care team.

Certain individual may have predisposition to certain *Health Risk*, which may or may not become health concern(s) over time. The model supports representation of these *Health Risks* to enable the care team to monitor them and have the awareness to implement mitigating actions if the need arises. An intervention, plan *Activity*, in turn may present certain *Health Risks* to the patient which must be closely monitored to prevent the manifestation of additional health concerns (e.g. the risk of administration of an immunosuppressant, surgery, etc.)

Please note that the various diagrams present partial views of the underlying model to improve clarity in the presentation. Review of all the models and how they relate to each other is expected for a comprehensive understanding of the Care Plan DAM.

The following diagram illustrates the high level associations of the core domain concepts directly associated with the abstract *Plan*; subsequent diagrams will introduce additional features and associations of these domain concepts.
4.2.1.2 Plan Class - Summary of Associations

Associations represent relationships between classes/concepts. The following are a set of associations depicted in the Care Plan conceptual model.

<table>
<thead>
<tr>
<th>Focus Concept</th>
<th>Associated Class</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>Organization</td>
<td>0..*</td>
<td>Stewardship of the plans is shared between the patient and zero or more organizations in which the patient is receiving care.</td>
</tr>
<tr>
<td>Plan</td>
<td>Patient</td>
<td>1..*</td>
<td>There is at least one patient who is the subject of care. Group therapy scenarios include more than one patient and as a result the cardinality is one or more.</td>
</tr>
<tr>
<td>Plan</td>
<td>Provider</td>
<td>0..*</td>
<td>The plan might have any combination of Providers, Care Givers or other Supporting Members forming the care team along with the Patient. These associations are different subsets of care team involvement or participation.</td>
</tr>
<tr>
<td>Plan</td>
<td>CareGiver</td>
<td>0..*</td>
<td>Health concerns specify the condition oriented reasons for creating the plan.</td>
</tr>
<tr>
<td>Plan</td>
<td>Supporting Member</td>
<td>0..*</td>
<td></td>
</tr>
</tbody>
</table>
ClinicalObjectReference allows for “observation” and/or “assessment” references.

<table>
<thead>
<tr>
<th>Plan</th>
<th>HealthGoal</th>
<th>1..*</th>
<th>A plan has at least one health goal which may either directly address a Health Concern or be the result of an internal patient motivation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>HealthRisk</td>
<td>0..*</td>
<td>A plan may capture a patient’s inherent health risks or risks that may be associated with certain interventions, so that there can be awareness among the care team as they monitor any impact on the patient’s health which may introduce new health concerns based on the risk.</td>
</tr>
<tr>
<td>Plan</td>
<td>CareBarrier</td>
<td>0..*</td>
<td>A care barrier presents a situation which impacts progression of the identified health goals by blocking specific interventions or activities. Interventions and other plan activities may be modified in order to remove the block.</td>
</tr>
<tr>
<td>Plan</td>
<td>CarePreference</td>
<td>0..*</td>
<td>A care preference is a statement expressed by the patient, custodian or caretaker responsible for the patient in order to influence how their care is delivered. A preference expresses a personal choice and may be driven by cultural, religious and moral principles. As such it is a principal component of patient centered care and autonomy. Care preferences serve as modifiers of the care plan which influence how the plan is personalized for the individual. A care preference may be specified prospectively to influence future care planning and treatment or it may be expressed and recorded at arbitrary decision points during interventions. A preference expresses a request to fulfill a patient's choice or desire. The choice may be a strong and absolute statement such as an end of life directive. The request could</td>
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<td>Plan</td>
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also be a desire to be fulfilled if possible
given care team capabilities and resources.

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<tr>
<th>Plan</th>
<th>Activity</th>
<th>0..*</th>
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<td>Activities</td>
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<td></td>
<td>include</td>
<td>interventions</td>
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<td>and other</td>
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<td>supporting</td>
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<td>necessary to</td>
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<td>carry out the</td>
<td>the plan</td>
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<td>plan</td>
<td>references</td>
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<td>plan</td>
<td>activities</td>
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<td>coordination</td>
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<td>of care</td>
<td>workflows.</td>
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<td>represented</td>
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<td>as supportive</td>
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<td>as supportive</td>
<td>reference</td>
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<td></td>
<td>as supportive</td>
<td>content.</td>
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<tr>
<th>Plan</th>
<th>AcceptanceReview</th>
<th>0..*</th>
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<td></td>
<td>An AcceptanceReview</td>
<td>captures</td>
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<td></td>
<td>An AcceptanceReview</td>
<td>The AcceptanceReview</td>
</tr>
<tr>
<td></td>
<td>An AcceptanceReview</td>
<td>general agreement</td>
</tr>
<tr>
<td></td>
<td>An AcceptanceReview</td>
<td>or disagreement about</td>
</tr>
<tr>
<td></td>
<td>An AcceptanceReview</td>
<td>the plan among care</td>
</tr>
<tr>
<td></td>
<td>An AcceptanceReview</td>
<td>team members.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan</th>
<th>PlanReview</th>
<th>0..*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan reviews</td>
<td>are performed</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>at periodic</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>intervals to</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>assess the</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>overall</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>consistency,</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>appropriateness,</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>completeness,</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>effectiveness.</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>includes</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>comprehensive</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>review of all</td>
</tr>
<tr>
<td></td>
<td>Plan reviews</td>
<td>the goals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plan</th>
<th>CommunicationThread</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A thread organizes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>individual plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>related communications in a meaningful manner for the benefit and understanding of care team.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication-Thread</th>
<th>Communication</th>
<th>1..*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>Communication</td>
<td>is ongoing during care coordination. Care team communications is what causes the unfolding of the plan as new participants join, propose actions, change goals, record interventions, review outcomes and assess effectiveness of individual actions and of the overall plan. A communication may pertain to any element of the care plan or the care record and reference the specific semantic context.</td>
</tr>
</tbody>
</table>
Figure 5. Associations Activity, Health Goal, Health Concern, Health Risk and Care Barriers

### 4.2.1.3 Health Goal Class - Summary of Associations

Associations for the health goal class are summarized below:

<table>
<thead>
<tr>
<th>Focus Concept</th>
<th>Associated Class</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HealthGoal</td>
<td>AcceptanceReview</td>
<td>0..*</td>
<td>An AcceptanceReview captures the care team’s (including patient) agreement with the health goals of the plan. It may also capture disagreement or compromises between care team members regarding what the goal should be. Capturing varying perspectives facilitates harmonization of the health goals in dynamic care plan applications.</td>
</tr>
<tr>
<td>HealthGoal</td>
<td>Priority</td>
<td>0..*</td>
<td>A goal may have priority specified by the care team members including the patient. Differing priorities help care team members focus on their areas but at the same time it aids with global team awareness of differences which may be important for care plan harmonization.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>HealthGoal (milestone)</strong></td>
<td>0..*</td>
<td>A Health Goal may be composed of finer grained intermediary milestones.</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------</td>
<td>------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>HealthGoal (replacement goal)</strong></td>
<td>0..*</td>
<td>A Health Goal may be replaced by an alternative at any point during the life span of the plan. This association captures replacement context in order to maintain awareness of a decentralized care team.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>HealthConcern</strong></td>
<td>0..*</td>
<td>The Health Goal may address zero or more health concerns. This association links the goal to an underlying condition oriented reason for setting the goal.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>CareBarrier</strong></td>
<td>0..*</td>
<td>A care barrier impacts goal achievement by blocking specific activities or interventions. This association raises awareness of blocks so that they can be addressed by the care team in collaboration with the patient.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>Activity</strong></td>
<td>0..*</td>
<td>A Health Goal supports an activity or intervention.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>Observation</strong></td>
<td>0..*</td>
<td>Outcome observations resulting from activities and interventions are linked to the supporting goal.</td>
</tr>
<tr>
<td><strong>HealthGoal</strong></td>
<td><strong>ActivityOutcomeReview</strong></td>
<td>0..*</td>
<td>A health goal determines a target which is evaluated when performing an Activity Outcome Review.</td>
</tr>
</tbody>
</table>

Activities in the context of planning express what is to be done, by whom, where it is to take place, and required resources necessary for execution. The following diagram elaborates on the concept of Activity and necessary associations.
4.2.1.4 Activity Class - Summary of Associations

Associations for the activity class are summarized below:

<table>
<thead>
<tr>
<th>Focus Concept</th>
<th>Associated Class</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Activity</td>
<td>0..*</td>
<td>An Activity may consist of multiple steps which are activities themselves. The applicability of the step is determined by a decision point which determines conditional execution.</td>
</tr>
<tr>
<td>Activity</td>
<td>OperationalActivityStatus</td>
<td>1</td>
<td>An Activity has a participant driven operational status as it is proposed, started, suspended and cancelled. There is just one status at any given time but the model supports capturing overtime snapshots to facilitate coordinated activities and reference point awareness by the care team.</td>
</tr>
<tr>
<td>Activity</td>
<td>AcceptanceReview</td>
<td>0..*</td>
<td>An AcceptanceReview captures the patient's acceptance of an activity or intervention upon discussion with his or her</td>
</tr>
</tbody>
</table>
The care team and weighting the pros and cons of treatment. The *AcceptanceReview* may also capture general agreement or disagreement about the activity among care team members.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Place</th>
<th>0..*</th>
<th>An Activity takes place somewhere along the continuum of care.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Role</td>
<td>0..*</td>
<td>An Activity has many types of care team involvement over time. A care team member may propose, reject, comment, modify, implement, etc. Awareness of who participated, why and what they did helps coordinate care team actions as they span time and space.</td>
</tr>
<tr>
<td>Activity</td>
<td>HealthGoal</td>
<td>0..*</td>
<td>An Activity is planned and implemented in support of specific care plan goals.</td>
</tr>
<tr>
<td>Activity</td>
<td>HealthRisk</td>
<td>0..*</td>
<td>An Activity may present Health Risks to the patient. In this case, the activity is linked to the Health Risk to be avoided in order to raise awareness within the care team. An Activity may also be implemented to mitigate a Health Risk introduced by either current patient health concerns, conditions or other planned activities.</td>
</tr>
<tr>
<td>Activity</td>
<td>CarePreference</td>
<td>0..*</td>
<td>An Activity may be modified by a patient Care Preference. The preference is linked in order to raise care team awareness so they can maintain a respect any personalization done in support of the preference.</td>
</tr>
<tr>
<td>Activity</td>
<td>CareBarrier</td>
<td>0..*</td>
<td>An Activity may be blocked by a Care Barrier. Linking the barrier to the activity supports raised care team awareness of the obstacle which must be removed</td>
</tr>
<tr>
<td>Activity</td>
<td>Observation</td>
<td>0..*</td>
<td>An Activity may link to any outcome observations resulting from its execution.</td>
</tr>
<tr>
<td>Activity</td>
<td>Communication</td>
<td>0..*</td>
<td>An Activity may involve any series of communication exchanges between care team participants.</td>
</tr>
<tr>
<td>Activity</td>
<td>ConsumableAllocation</td>
<td>0..*</td>
<td>An Activity may require consumable materials as part of its planning. The</td>
</tr>
</tbody>
</table>
allocated materials are used during the activity's implementation.

<table>
<thead>
<tr>
<th>Activity</th>
<th>ServiceAllocation</th>
<th>0..*</th>
<th>An Activity may require any number of services to be scheduled as part of its planning. The services may be a requirement before the activity can be implemented.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>AssetAllocation</td>
<td>0..*</td>
<td>An Activity may require any number of assets such as rooms, equipment or human resources to support successful planning. The rooms, equipment or human assets are required before the activity can take occur.</td>
</tr>
</tbody>
</table>

Figure 7. Types of Reviews

### 4.2.1.5 Review Classes - Summary of Associations

Associations representing for the review classes are summarized below:

(Note – descriptions of these associations are similarly expressed in previous tables and will not be repeated here)

<table>
<thead>
<tr>
<th>Focus Concept</th>
<th>Associated Class</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AcceptanceReview</td>
<td>Plan</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>AcceptanceReview</td>
<td>HealthGoal</td>
<td>0..*</td>
<td></td>
</tr>
</tbody>
</table>
### 4.2.1.6 Communication Classes - Summary of Associations

Associations representing for the communication classes are summarized below:

<table>
<thead>
<tr>
<th>Focus Concept</th>
<th>Associated Class</th>
<th>Cardinality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>Conversation</td>
<td>0..*</td>
<td>A Plan may reference multiple conversation threads which group related communications for the benefit of the care team.</td>
</tr>
<tr>
<td>CommunicationThread</td>
<td>Communication</td>
<td>0..*</td>
<td>A conversation consists of multiple discrete communication exchanges</td>
</tr>
</tbody>
</table>
between two or more care team members.

<table>
<thead>
<tr>
<th>Communication/Thread</th>
<th>Concept</th>
<th>Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HealthConcern</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>HealthRisk</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>HealthGoal</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>CareBarrier</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td>0..*</td>
<td></td>
</tr>
<tr>
<td>PatientPreference</td>
<td>0..*</td>
<td></td>
</tr>
</tbody>
</table>

Care team communications or communication threads may relate to any part of the plan.

These associations capture possible subjects of communications for Health Concerns, Health Risks, Health Goals, Activities, Care Barrier, Patient Preferences and Observations.

**4.2.1.7 Externalizing Business Rules and Decision Points**

As mentioned in earlier sections the Care Plan model is agnostic to organizational policies and business rules. The model makes use of *Decision* and *Criterion* concepts to represent functional logic based on policies, organization decisions and business rules. For example, activities of the Plan may be conditionally executed based on decision points and they may also declare pre-conditions which use the care planning Context to determine applicability of an action and modify behavior.

![Decision Points and Criteria in Care Plan](image)

**Figure 9. Decision Points and Criteria in Care Plan**

**4.3 Care Plan Organizing Framework for Coordination of Care Models**

The following content from the *HL7 Document Coordination of Care Service Functional Model, Release 1 (May 2014)* Draft Standard for Trial Use describes an organizing framework for coordination of care.
dynamic models. It may be viewed as a meta-model for coordination of care interaction and collaboration models. The organizing model establishes the relationships between Health Event, Care Management Activity, Care Collaboration and Shared Content.

**Shared Content** consists of the care plan and other associated information content. Shared content is synchronized among care team participants. The main idea is to support shared care team awareness and transparency of the patient’s care in order to eliminate gaps, redundancies and conflicts in the information and in the care process. Shared content is updated at various stages of interaction (including synchronization, harmonization, post negotiation) leading to self-organizing and reconciled systems. Shared content is incrementally created as a result of ongoing interactions.

**A Health Event** is an occurrence of importance to the health of the patient. The event may result from a change in the patient’s physical, socio-economic status reported by the patient/family, or change in information or knowledge resulted from care management activities or from care team collaboration and interactions, which is often or should be directly recorded. The event in turn may trigger new care management activities or new collaborations and interactions which in turn result in incremental updates to the shared content and context.

**A Care Management Activities** is the act of developing care strategies and the performance of tasks (which includes investigations, interventions and evaluations) in support of patient’s care by one or more care team members. Care management activities are indicated in the plan.

**Care Team Collaboration** emerges during the evolution of care team evaluation, decision making and autonomous direction within the constraints of professional standards, policies, business rules, care team working agreements and social contracts.

**Business rules and policies** are out of the scope of this specification. The meta-model simply acknowledges their existence and their relationship as a constraint in guiding care management activities and care team collaboration. Coordination of care systems would make available their model content and context to support decision making based on business rules and organization policies. The model content corresponds to the input and outputs defined in the capabilities defined in this document and the model detailed in the HL7 Care Plan DAM.
Figure 10. Organizing Framework for Coordination of Care Interaction Models

A view of the dynamic, ongoing and emergent care team contribution based on a shared care plan may look as follows:

1. A care team member looks up an existing plan
   - A plan may be created if none exists or its existence is not known
2. The plan changes based on the care team member’s assessment with the patient
   - Health goals, care preferences, health concerns, health risks, care barriers, care activities and interventions are assessed, validated, added, changed or removed.
3. The plan leads to a cycle of intervention, outcomes and review
4. The patient may be referred to a specialist or other health and social services providers
   - The care team member requests participation from the specialist or other providers and subsequently shares the plan
5. As the patient transitions to the specialist or other health provider care settings the care event steps can be repeated with the actors represented by the generic “care team member”
6. Communication may occur at any time between care team members as they react to synchronized content change updates.

4.4 Care Plan Logical Information Model

The logical information model augments the “primitive” concepts defined in the conceptual model with data properties necessary to capture information for point in time data exchange and dynamic coordination of care interactions. At the logical information level, the model includes the level of detail required for supporting IT systems but it is still not an implementation model. The model is open and...
unconstrained in order to support multiple use cases/specifications with varying viewpoints but shared information semantics.

The logical information model classes map one to one with the conceptual model and are directly traceable to the Care Plan project’s collection of storyboards included in this document and incorporates review comments received from the ONC LCC HL7 Tiger Team. It is intended to support technological/platform specific implementable models including HL7 Care Plan R-MIMs, Consolidated Clinical Document Architecture (C-CDA) Care Plan documents and clinical statements (entries) within the C-CDA Plan of Treatment Section, and HL7/OMG Coordination of Care Services specification.

All concepts and associations from the concept model are preserved and necessary data properties are included. This section will focus on description of the attributes. Please refer to the conceptual model section for a comprehensive understanding of the concept relationships. They complete the conceptual model attribute details which we now describe.
Figure 11. Care Plan Logical Information Model
4.4.1.1 OperationalStatusType Description

The operational status type applies to the Plan, individual Activity instances and to Health Goals. The status type is user determined; there is no deterministic state transition. The type specifies when the concept status is proposed, started, completed, suspended or cancelled.

4.4.1.2 Plan Attributes

The Plan captures the shared attributes for Care Plan, Plan of Care and Treatment Plan.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>completeDate</td>
<td>DateTime [0..1]</td>
<td>Specifies when the plan status is changed to complete (e.g. when all goals are achieved, health concerns resolved)</td>
</tr>
<tr>
<td>confidentiality</td>
<td>ConfidentialityType [0..1]</td>
<td>Specifies the plan's confidentiality level</td>
</tr>
<tr>
<td>createDate</td>
<td>DateTime [0..1]</td>
<td>Specifies when the plan was created</td>
</tr>
<tr>
<td>discipline</td>
<td>Code[0..*]</td>
<td>Specifies zero or more discipline or clinical specialties viewpoints represented in the plan</td>
</tr>
<tr>
<td>displayName</td>
<td>String [0..1]</td>
<td>Descriptive display name for the plan</td>
</tr>
<tr>
<td>effectiveDate</td>
<td>DateTime [0..1]</td>
<td>Specifies the start of the plan implementation</td>
</tr>
<tr>
<td>id</td>
<td>Identifier [1..1]</td>
<td>A unique identifier for the plan</td>
</tr>
</tbody>
</table>
### lastUpdateDate

**Data Type:** DateTime [0..1]

Specifies the last date/time the plan was changed.

### description

**Data Type:** Code [0..1]

Indicates a descriptive coded type for the plan.

### version

**Data Type:** String [0..1]

A value indicating some changes (e.g. concern, goal, risk, proposed actions) in a plan and denoting that it is different from the previously published form.

#### 4.4.1.3 Health Concern Attributes

Please reference the Health Concern domain analysis model for details.

#### 4.4.1.4 Health Goal Attributes

A health goal specifies a future target or achievement towards which the effort of care planning and execution is directed. Goals represent concrete targets to reduce or eliminate concerns or risks. A Goal may exist in the absence of concerns or risks. For example, a patient may have a goal to improve their fitness level. The plan always has at least one goal.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>goal</td>
<td>Code</td>
<td>Names or describes the goal</td>
</tr>
<tr>
<td>goalIntention</td>
<td>IntentionType [0..1]</td>
<td>The goal intent is a modifier of the goal purpose and indicates whether the goal target is something to achieve, maintain, manage or avoid. For example, in late stage diabetes the only path may be to simply manage or control the condition.</td>
</tr>
<tr>
<td>narrative</td>
<td>String [0..1]</td>
<td>Captures comments or notes about the goal</td>
</tr>
<tr>
<td>priority</td>
<td>Priority[0..*]</td>
<td>Indicates the preference order to use for care planning purposes. The goal supports multiple priorities in order to support multiple care team perspectives and eventual harmonization.</td>
</tr>
<tr>
<td>expressedBy</td>
<td>Role [0..*]</td>
<td>The individual noting the goal. A health goal can be expressed by a patient, family or provider. When multiple person roles are captured in the expressedBy attribute, this represents that the Health Goal is one that is...</td>
</tr>
</tbody>
</table>
approved by all parties or is a negotiated outcome of all parties identified.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>planStatus</td>
<td>OperationalActivityStatus [0..1]</td>
<td>Indicates the implementation stage for the goal and related plan components.</td>
</tr>
<tr>
<td>successCriteria</td>
<td>Criterion[0..*]</td>
<td>Defines criteria which must be met to determine goal achievement.</td>
</tr>
<tr>
<td>targetDate</td>
<td>DateTime [0..1]</td>
<td>Desired target date for meeting the goal</td>
</tr>
<tr>
<td>responsiblePerson</td>
<td>Role[0..*]</td>
<td>Captures care team member(s) who is/are accountable for managing and/or tracking of the patient’s health goal.</td>
</tr>
</tbody>
</table>

### 4.4.1.5 Health Risk Attributes

Risks may represent clinically significant potential concerns to the patient’s health. They are captured in order to monitor and mitigate the manifestation of a future concern. Risks may be raised based on clinical evidences or they may capture a provider’s judgment.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>description</td>
<td>Code [0..1]</td>
<td>Names or describes the risk</td>
</tr>
<tr>
<td>riskFactor</td>
<td>RiskFactorType [0..1]</td>
<td>Category for the risk</td>
</tr>
<tr>
<td>effectiveTime</td>
<td>DateTime [0..1]</td>
<td>Date/time at which the risk is identified</td>
</tr>
<tr>
<td>levelOfRisk</td>
<td>LevelType [0..1]</td>
<td>A risk is clinically significant but the level may be low, medium or high depending on care team judgment.</td>
</tr>
<tr>
<td>expressedBy</td>
<td>Role [0..1]</td>
<td>The individual who identified the risk. A Health Risk can be identified by a patient, family or provider. Multiple person roles captured by the expressedBy attribute indicates the item is approved or negotiated by all parties identified.</td>
</tr>
<tr>
<td>responsiblePerson</td>
<td>Role[0..*]</td>
<td>Captures care team member(s) who is/are accountable for a specific aspect of the patient’s health risk.</td>
</tr>
<tr>
<td>resolvedTime</td>
<td>DateTime [0..1]</td>
<td>The date the risk is no longer a threat to the health of the patient.</td>
</tr>
</tbody>
</table>
4.4.1.6 Care Barrier Attributes

A barrier impacts specific interventions or other plan activities and may necessitate their modification. Barriers are situations outside the health care system which nonetheless reduce or block quality of care and also increase cost. Barrier may also impact on goals achievement if modifications to interventions cannot effectively overcome identified barriers.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>barrierType</td>
<td>BarrierType [0..1]</td>
<td>Names or describes what the barrier is</td>
</tr>
<tr>
<td>comment</td>
<td>String [0..1]</td>
<td>Free form comments related to the barrier</td>
</tr>
<tr>
<td>effectiveDate</td>
<td>DateTime [0..1]</td>
<td>The date/time the barrier was identified</td>
</tr>
<tr>
<td>expressedBy</td>
<td>Role [0..*]</td>
<td>Individual who identified the barrier(s). A care barrier can be identified by a patient, family member or provider. Multiple person roles captured by the expressedBy attribute indicates the item is approved or negotiated by all parties identified.</td>
</tr>
<tr>
<td>responsiblePerson</td>
<td>Role[0..*]</td>
<td>Captures care team member(s) who is/are accountable for a specific aspect of the patient’s health barrier.</td>
</tr>
<tr>
<td>resolvedDate</td>
<td>DateTime [0..1]</td>
<td>The date/time when the barrier is either resolved or an acceptable alternative is found.</td>
</tr>
</tbody>
</table>

4.4.1.7 Care Preference Attributes

A care preference is a statement expressed by the patient, custodian or caretaker responsible for the patient in order to influence how their care is delivered.

A preference expresses a personal choice and may be driven by cultural, religious and moral principles. As such it is a principal component of patient centered care and autonomy. Care preferences serve as modifiers of the care plan which influence how the plan is personalized for the individual.

A care preference may be specified prospectively to influence future care planning and treatment or it may be expressed and recorded at arbitrary decision points during interventions.

A preference expresses a request to fulfill a patient’s choice or desire. The choice may be a strong and absolute statement such as an end of life directive. The request could also be a desire to be fulfilled if possible given care team capabilities and resources.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>preference</td>
<td>Code[0..1]</td>
<td>Descriptive code which specifies the type of the patient preference</td>
</tr>
<tr>
<td>reason</td>
<td>Code[0..*]</td>
<td>Captures a reason indicator for the preference. The reason may be classified as cultural,</td>
</tr>
</tbody>
</table>
religious, moral/ethical. The reason is a factor which should already be included in considering the strength of the preference. It is explicitly indicated in the model in order to provide context for handling with sensibility.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>effectiveDate</td>
<td>DateTime [0..1]</td>
<td>The date/time the preference becomes effective for consideration when providing care.</td>
</tr>
<tr>
<td>expressedBy</td>
<td>Role [0..*]</td>
<td>The individual who expressed the preference. This is typically the patient but it may also be the patient's caretaker (e.g. in the case of a patient who is not able to decide for himself/herself such as a child or individual with some form of incapacitation). Multiple person roles captured by the expressedBy attribute indicates the item is approved or negotiated by all parties identified.</td>
</tr>
<tr>
<td>strength</td>
<td>LevelType [0..1]</td>
<td>The strength indicates flexibility in the interpretation of the patient's choice by the care team participants. The strength may be High and indicate an absolute choice driven by moral principles, cultural or religious principles. Or it may indicate an important desire which the patient has but for which the patient has flexibility. The strength may have a value of either High (absolute choice) or Low (desired choice).</td>
</tr>
<tr>
<td>notes</td>
<td>Note[0..*]</td>
<td>Optional notes about the preference. The note captures a text narrative, date of the note and the individual making the note.</td>
</tr>
<tr>
<td>media</td>
<td>URL[0..*]</td>
<td>Optional link to external documentation supporting the preference (e.g. scanned advance directive or legal documents on file).</td>
</tr>
<tr>
<td>activationCriteria</td>
<td>Criterion [0..*]</td>
<td>Specifies how the preference is matched to an Intervention and the conditions under which it is activated.</td>
</tr>
<tr>
<td>alternatePreference</td>
<td>CarePreference [0..*]</td>
<td>A list of ordered alternate preferences acceptable to the patient or caretaker in case the primary preference cannot be fulfilled. The ordering indicates the next best alternative for the patient.</td>
</tr>
<tr>
<td>acceptance</td>
<td>AcceptanceReview [0..*]</td>
<td>Captures acceptance or acknowledgement of the preference by one or more care team members.</td>
</tr>
</tbody>
</table>
members. Acceptance represents alignment of the patient and providers understanding.

unfullfilledReason String [0..*]
Captures the reason why a preference cannot be applied during an intervention in which the preference should apply. This property can only be set for preferences associated with a Health Activity.

![Plan Activity Logical Information Model](image)

**Figure 13. Plan Activity Logical Information Model**

### 4.4.1.8 Activity Attributes

The activity is a general concept which represents the common attributes required for planning and execution. The activity has a timeframe, actual start and end dates and it may repeat over time at a given frequency.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4.1.9 Resource Allocation Attributes

Successful execution of any plan requires resources. Plan activities indicate resources which must be allocated in preparation for implementation of the activity which uses the resources.

The achievement of plan activities requires allocation of human, asset, consumable and service resources.

The Care Plan model captures three types of resource allocations which represent allocations for consumable/materials, services and assets.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>media</td>
<td>URL[0..*]</td>
<td>Specifies supporting media content for the resource.</td>
</tr>
<tr>
<td>resourceType</td>
<td>Code [0..1]</td>
<td>Specifies the resource type.</td>
</tr>
</tbody>
</table>

4.4.1.10 Consumable Allocation Attributes

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>quantity</td>
<td>Quantity [0..1]</td>
<td>Specifies the quantity of material or consumable.</td>
</tr>
</tbody>
</table>
### 4.4.1.11 Service Allocation Attributes

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>period</td>
<td>TimePeriod [0..1]</td>
<td>Specifies the time period for which the service needs to be available or scheduled.</td>
</tr>
</tbody>
</table>

### 4.4.1.12 Asset Allocation Attributes

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>period</td>
<td>TimePeriod [0..1]</td>
<td>Specifies the time period for which the asset needs to be available.</td>
</tr>
<tr>
<td>credentialed</td>
<td>Code[0..*]</td>
<td>Specifies any credentials required by the resource.</td>
</tr>
<tr>
<td>privilege</td>
<td>Privilege[0..*]</td>
<td>Indicates required or held privileges for a human resource</td>
</tr>
</tbody>
</table>

### 4.4.1.13 Review Type

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>role</td>
<td>Role [0..1]</td>
<td>Specifies the individual providing the review</td>
</tr>
<tr>
<td>comments</td>
<td>String[0..*]</td>
<td>Specifies optional comments for the review</td>
</tr>
<tr>
<td>effectiveDate</td>
<td>DateTime [0..1]</td>
<td>Specifies the date/time of the review</td>
</tr>
</tbody>
</table>

Figure 14. Plan Reviews Logical Information Model
4.4.1.14  Acceptance Review Attributes

Acceptance reviews capture understanding and agreement to adopt a proposal for health goals, interventional actions or the plan itself. E.g. Upon review of the goals and actions a care manager (e.g. nurse case manager, social worker, physical therapist, pharmacist), PCP, nurse and patient will indicate understanding and acceptance of the care plan. Acceptance reviews may be used to indicate a provider’s authorization to perform an intervention and another’s provider acknowledgement.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>acceptance</td>
<td>AcceptanceType [0..1]</td>
<td>Indicates the type of acceptance expressed by the care team member and/or patient.</td>
</tr>
<tr>
<td>applicability</td>
<td>TimeRecord[0..1]</td>
<td>Indicated if there is an applicable time period for the acceptance. The acceptance is invalid when outside the specified time period.</td>
</tr>
</tbody>
</table>

4.4.1.15  Activity Outcome Review Attributes

An activity outcome review measures the result of individual implemented action (observational or interventional) against goal success criteria. The action outcome review might address only a subset of goal success criteria.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>evaluation</td>
<td>OutcomeType [0..1]</td>
<td>Specifies the type of outcome determined based on the review</td>
</tr>
<tr>
<td>interventionEffectiveness</td>
<td>LevelType [0..1]</td>
<td>Indicates a judgment evaluation regarding the intervention effectiveness</td>
</tr>
</tbody>
</table>

4.4.1.16  Goal Review Attributes

Goal reviews reference multiple action outcomes reviews which support overall assessment of a HealthGoal.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>goalAchievementState</td>
<td>AchievementStateType [0..1]</td>
<td>Specifies a judgment on the goal achievement state</td>
</tr>
<tr>
<td>goalSuccessCriteria</td>
<td>Criterion[0..*]</td>
<td>Indicates criteria for assessment goal achievement</td>
</tr>
<tr>
<td>nextScheduledReview</td>
<td>DateTime [0..1]</td>
<td>Specifies the date/time of the next review</td>
</tr>
</tbody>
</table>
4.4.1.17 Plan Review Attributes

Plan reviews are performed at periodic intervals to assess the overall consistency, appropriateness, completeness and effectiveness of the plan. The plan review includes comprehensive review of all the goals.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>healthAssessmentStatus</td>
<td>HealthStatusType</td>
<td>Indicates assessment of the health of the patient</td>
</tr>
<tr>
<td>nextScheduledReview</td>
<td>DateTime</td>
<td>Indicates the next scheduled review date</td>
</tr>
<tr>
<td>planReviewOutcome</td>
<td>String</td>
<td>Captures a text comment of the outcome review</td>
</tr>
<tr>
<td>reviewFrequency</td>
<td>Frequency</td>
<td>Specifies a periodic frequency for future reviews</td>
</tr>
</tbody>
</table>
4.4.1.18 Conversation Attributes

A conversation organizes individual communications in a meaningful manner for the benefit and understanding of care plan stakeholders.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>topic</td>
<td>Code [0..1]</td>
<td>Indicates the topic of the conversation</td>
</tr>
<tr>
<td>confidentiality</td>
<td>ConfidentialityType [0..1]</td>
<td>Indicates whether the conversation is visible to all care team members or to a specific subset of care team members.</td>
</tr>
</tbody>
</table>
4.4.1.19 Communication Attributes

Communication is ongoing during care coordination. Care team communications is what causes the unfolding of the plan as new participants join, propose actions, change goals, record interventions, review outcomes and assess effectiveness of individual actions and of the overall plan.

A communication may pertain to an element of the care plan or the care record and reference the specific semantic context.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>associatedCommunication</td>
<td>Communication[0..*]</td>
<td>Specifies past associated communications</td>
</tr>
<tr>
<td>effectiveDate</td>
<td>DateTime [0..1]</td>
<td>Specifies the date/time of the communication</td>
</tr>
<tr>
<td>formId</td>
<td>String [0..1]</td>
<td>Specifies a formId if the communication is a response to a structured form</td>
</tr>
<tr>
<td>pertainsTo</td>
<td>ClinicalObjectReference [0..*]</td>
<td>Links the communication to some clinical object which is the target of the communication</td>
</tr>
<tr>
<td>receiver</td>
<td>Role[1..*]</td>
<td>Specifies the receiver of the communication</td>
</tr>
<tr>
<td>source</td>
<td>Role [0..1]</td>
<td>Specifies the source or sender of the communication</td>
</tr>
<tr>
<td>topic</td>
<td>String [0..1]</td>
<td>Specifies the subject of the communication</td>
</tr>
<tr>
<td>content</td>
<td>String [0..1]</td>
<td>Specifies the content of the communication</td>
</tr>
</tbody>
</table>

4.5 Care Plan Process Model

Many models are used to describe care coordination and care plan. These models were considered and were influential during the development of the CP DAM.
4.5.1 Coordination of Care Model

![Coordination of Care Model Diagram](image)

Figure 16. Institute of Health Improvement Coordination Model for people with multiple health and social needs


4.5.2 High Level Care Plan Development

Although the CP DAM does not address the care planning process and governance across care settings and disciplines, it was determined there is a core process to building or creating a Care Plan that is important to the data model. This process is described in the diagrams below.

![Care Plan Development Diagram](image)

*This is based on a broad review. All converge.*

*Need a concept of a master care plan with all the concerns and problems.*

*Add care coordination activities in these activities.*

*May need to revise goals and outcomes during the process of care.*

*Himiong has similar model. Also use standardized language.*

*Hierarchy or interconnected plans can apply.*

*Every spot group has specific ways to deliver care. Here we focus on the overall coordination of care.*

*Is there always a care coordinator? Patients could be the coordinator of their own care. They should be active participants.*

*This diagram is about process, not interactions and actors.*

Figure 17. Care Plan Development.
4.6 Requirements

The model below was developed by the S&I Framework LCC community and describes the relationship and requirements of many items included in the CP DAM.

The Plan of Care (Conditions, Goals and Interventions), along with Risk Factors and Decision Modifiers, iteratively evolve over time.
4.7 Intended Implementation

The care plan model and its components described in this document are intended to support effective coordination of care of patient with complex health problems and needs. They can be used in implementation of dynamic and static care plans.

Dynamic care plans require the support of complex workflow management and standard care coordination services (CCS) profiles and capabilities. A CCS functional model incorporating CCS profiles was developed in collaboration of the HL7 Services Oriented Architecture (SOA) Group. The CCS functional model had gone through one cycle of (for comments) ballot. The ballot reconciliation process is ongoing. The CCS specification can be accessed through this link:

http://wiki.hl7.org/index.php?title=Care_Coordination_Service

Static care plans are instances of dynamic care plans at given points-of-time and can be exchanged, for example, as CDA documents.

The Consolidated CDA (C-CDA) Release 2 (R2) Care Plan document level template was developed with the sponsorship of the ONC Longitudinal Care Coordination project in the Structured Documents Workgroup is intended to support the implementation of static care plan exchanges using CDA infrastructure based on the Care Plan model.

The care plan model supports nesting of different types of plans (e.g. treatment plan, plan of care and care plan). But that is not necessarily how care plan should be implemented.

4.8 Risks to Implementation

The Care Plan model and DAM contents are still evolving as the model and related DAM contents are exposed to wider reviews and comments. Substantial changes to the model and related contents are likely based on ballot comments received. Backward compatibility of later version of subsequent versions may not be guaranteed.
5 APPENDICES

5.1 Appendix 1: Example Relevant Quality Data Model Definitions


Care Goal
A defined target or measure to be achieved in the process of patient care; an expected outcome. A typical goal is expressed as a change in status expected at a defined future time. That change can be an observation represented by other QDM categories (diagnostic tests, laboratory tests, symptoms, etc.) scheduled for some time in the future with a particular value. A goal can be found in the plan of care (care plan). The plan of care (care plan) is the structure used by all stakeholders, including the patient, to define the management actions for the various conditions, problems, or issues identified for the target of the plan. This structure, through which the goals and care-planning actions and processes can be organized, planned, communicated, and checked for completion is represented in the QDM categories as a Record Artifact. A time/date stamp is required. Specifically, a care plan is composed of the following elements:

- Problem, which is managed by other QDM standard categories (condition/diagnosis/problem) and their related data elements.
- Procedure, which is managed by other standard categories and their related data elements. Note that procedures are a continuum of interventions ranging from actions patients can do for themselves or those that can be performed by others (caregivers or clinical professionals) to including detailed complex surgical procedures requiring highly trained physicians, nurses, and state-of-the-art facilities.
- Goal, which is what is expected to happen.
- Outcome, which is what happened that can be shown by other QDM standard categories and their related data elements.

Condition/Diagnosis/Problem
A scientific interpretation of result, assessment, and treatment-response data that persists over time and tends to require intervention or management or a clinical feature that includes but is not limited to those treated, monitored, evaluated, or impacts other treatment or venues of care (e.g., encounters or lengths of stay). It is used to guide planning, implementation, treatment, and evaluation. A problem or condition includes, but is not limited to, acute, intermittent, or chronic conditions; diagnoses; symptoms; functional limitations; or visit- or stay-specific conditions.

Intervention
An intervention is a course of action intended to achieve a result in the care of persons with health problems that does not involve direct physical contact with a patient. This category is included to help differentiate care provided to patients that does not involve direct hands-on activity. Examples include patient education and therapeutic communication.

Risk Category / Assessment
Risk category assessments include tools and calculators that suggest vulnerabilities for any given patient. Distinct from functional status, risk categorization uses findings, observations, results, and sometimes judgments and patient-generated information for use within clinical care algorithms, clinical decision support, and severity analysis. A time and date stamp is required. Examples: Braden Score for Predicting Pressure Score Risk, Morse Fall Risk Scale, Pneumonia Severity Index.
**Symptom**
An indication that a person has a condition or disease. Some examples are headache, fever, fatigue, nausea, vomiting, and pain. Also, symptoms are subjective of the disease perceived by the patient. As an example to differentiate symptom from finding, the patient's subjective symptom of fever is distinguished from the temperature (a finding). For a finding, there is a source of either a temperature-measuring device, and there is a recorder of the device (electronically) or an individual (healthcare provider, patient, etc.)

### 5.2 Appendix 2: International Care Plan Structures Comparison

In 2011 the HL7 PCWG Care Plan project team requested international contributors to provide care plan models that were designed and/or in use from various realms. The team received contributions from Australia, IHE, Sweden, and NHS England. A comparative analysis of these care plan structures was conducted. Common components have been identified from the different structures:

- **Context related components**, e.g. type, date and time, participants (subject of care, provider/care team), version tracking
- **Content related components**, e.g. problem, goal and milestone, action (orders, implementation, outcome review)

Result of this analysis was used to inform the initial discussions and modeling works on care plan models. A diagrammatic representation of the comparative analysis can be downloaded from this HL7 PCWG Care Plan wiki link (under the "Working Documents and Project Deliverables section):

http://wiki.hl7.org/images/4/46/CarePlanStructure_compare_Australia_Sweden_IHE_NHS_20110406.jpg

(NOTE: the Care Plan structure comparison diagram contains too many details to be incorporated into this document. It is available as an image file at the link given above to allow visualization of full details of the content)

### 5.3 Appendix 3: Additional Storyboards

#### 5.3.1 Storyboard 2: Acute Care

**5.3.1.1 Short Description of the health issue thread covered by this storyboard**

The purpose of this storyboard is to illustrate the dynamic nature of care plans, which are informed by additional information and changes in status of associated health concerns, actions, goals and relevant clinical information including observations and results. It also helps to illustrate that care plans may not just be valuable in long-term care or management of chronic conditions, but also are important in acute care, even if a care plan is only in place for a matter of minutes.

The key point is that care plans may be episodic or longitudinal, depending on the context of use, and can capture care, which is intended, scheduled, requested, and delivered. This approach takes a forward-looking expression of what should happen, while also capturing what actually happened.

This storyboard consists of these patient encounters:
- A. Primary Care Provider Encounter
- B. Second Outpatient Encounter
- C. Emergency Medical Services and Pre-Hospital Care
D. Emergency Department Encounter

5.3.1.1.1 **Storyboard Actors and Roles**

- Emergency Physician: Dr. Erik E. Mergency, MD
- Emergency Physician (medical control): Dr. Archie Emergency, DO
- Primary Care Provider: Dr. Paul Primary, MD
- Patient: Robert Anyman
- Triage Nurse: Pat Sorter, RN/BSN, CEN
- Emergency Nurse: Jean Careful, RN/BSN, CEN
- Respiratory Therapist: Brie Theeply, RRT
- Paramedic (EMT-P): Sam Scooper

5.3.1.1.1.1 ENCOUNT A: PRIMARY CARE PROVIDER ENCOUNTER

5.3.1.1.1.1.1 **PRE-CONDITION**

Mr. Anyman is a 26 year-old married man with a history of migraine headaches, who presents to his regular physician (Dr. Primary) with a month of symptoms of depressed mood, irritability, early morning awakening (terminal insomnia), and loss of enjoyment of social activities. He has some problems with work, particularly getting to work on time in the morning. His only chronic medications are atenolol 25 mg daily for migraine headache prophylaxis, ibuprofen and sumatriptan for abortive therapy of migraines.

5.3.1.1.1.1.2 **DESCRIPTION OF EVALUATION AND MANAGEMENT**

Dr. Primary performs a history and physical examination, as well as administers two standardized assessment scales for depression severity (Patient Health Questionnaire-9 (PHQ-9) and Hospital Anxiety and Depression Scale (HADS)). Dr. Primary discusses the nature of depression, and asks Mr. Anyman to consider which symptoms are most bothersome and use these to set goals. Mr. Anyman indicates that sleep related issues and difficulty waking up in the morning were the biggest problem, and his wife had expressed some concern that he was shaving, showering and dressing professionally less often than desired. These are agreed upon goals. He prescribes a selective serotonin re-uptake inhibitor (SSRI) class antidepressant as part of order sets and a care plan for major depressive disorder in adults. The plan includes a referral to a non-physician mental health provider for evaluation for cognitive behavior therapy, assessment of response to the SSRI antidepressant, screening for suicide risk, screening for substance abuse, and a follow up visit in four weeks.

5.3.1.1.1.3 **POST-CONDITION**

Both the PHQ-9 and HADS indicate moderately severe depression, the screen for suicide indicates low risk, and the substance abuse screen indicates occasional binge drinking. The patient is given information regarding community resources, a copy of *The Feeling Good Handbook*, and a referral to a therapist, which is included in his insurance coverage, as well as suicide precautions, and the link to the practice’s patient portal, where he is asked to do on-line PHQ-9 and HADS. An electronic prescription for citalopram 20 mg daily #30, and temazepam 15 mg as needed at bedtime #6. After he schedules a follow up visit, and an initial evaluation with the therapist he is discharged to home.

5.3.1.1.1.2 ENCOUNT B: SECOND OUTPATIENT ENCOUNTER

5.3.1.1.1.2.1 **PRE-CONDITION**

Soon after starting on the SSRI. Mr. Anyman noted increasing frequency and severity of headaches. These were similar to his usual migraine headaches, and on three occasions had to leave work or call in sick due to severity.
5.3.1.1.1.2.2 DESCRIPTION OF CLINIC VISIT #2 EVALUATION AND MANAGEMENT
Dr. Primary determines that the citalopram is a likely cause for the increased frequency of headaches, and discontinues the medication, noting an adverse reaction to the medication. Nortriptyline 25 mg by mouth at bedtime, with increasing doses every few days to a target dose of 150 mg is prescribed as a substitute for the citalopram.

5.3.1.1.1.2.3 POST-CONDITION
Self-care instructions updated to indicate need to track orthostatic symptoms, arise slowly from bed to avoid syncope, and methods for mitigation of anticholinergic symptoms. Updated prescriptions sent electronically, and patient's care plan tracking method (part of patient record) updated with new goal (to return to full function without headaches).

5.3.1.1.1.3 ENCOUNTER C: EMERGENCY MEDICAL SERVICES AND PRE-HOSPITAL CARE

5.3.1.1.1.3.1 PRECONDITION
The patient's wife has called for an ambulance after he took an overdose nortriptyline (a tricyclic antidepressant TCA). The EMS unit consists of a basic emergency medical technician (EMT-B) and Mr. Sam Scooper, the paramedic (EMT-P). Dr. Mergency is working in the community hospital where the EMS agency routinely transports critically ill patients. Dr. Archie Emergency provides on-line medical control for the EMS unit after their initial evaluation of the patient.

Several standing orders are in place in both the emergency department and the EMS unit, which define specific actions to take, given a particular set of preconditions.

5.3.1.1.1.3.2 DESCRIPTION OF EMS EVALUATION AND TRANSPORTATION
The patient has mild tachycardia, is somewhat agitated, and is confused as to date/time and circumstances surrounding the overdose. The paramedic contacts the regional poison control center, and is advised to administer activated charcoal. The paramedic contacts medical control (Dr. Emergency) who orders an intravenous line with normal saline if it will not delay transport. Cardiac and vital sign monitoring is established en route to the hospital with an ETA of 5 minutes.

5.3.1.1.1.3.3 POST-CONDITION
The patient's depression care plan is currently in limbo, as more pressing items supplant the requirements. The paramedic documents the new care plan, consisting of 4-point soft restraints, oral administration of activated charcoal, monitoring, establishing intravenous access, and transportation to the nearest emergency department.

5.3.1.1.1.4 ENCOUNTER D: EMERGENCY DEPARTMENT ENCOUNTER

5.3.1.1.1.4.1 PRE-CONDITION
The patient arrives to the emergency department and is triaged into a high acuity bed. The initial set of vital signs obtained by the paramedic en route to the ED shows HR 106, BP 134/88, RR 18, SaO2 99% on room air. The patient has not complied with requests to consume the activated charcoal by mouth.
5.3.1.1.1.4.2 DESCRIPTION OF ED COURSE
The initial care plan is dictated by standardized procedures for a potentially suicidal patient and for potential drug ingestion. Upon entry of the potential ingestion, specific orders are added to the plan. This includes a 12 lead ECG, comprehensive metabolic profile, serum acetaminophen level, serum aspirin level, activated charcoal, urinalysis, serum TCA level, blood alcohol level, urine toxicology screen, intravenous line with normal saline.

The 12 lead ECG and activated charcoal administration are automatically triaged as the highest priority activities. These occur in conjunction with establishing vascular access, drawing blood, re-attaching restraints.

The patient continues to balk at swallowing the activated charcoal, so a nasogastric tube is added to the care plan to administer it. However, the plan components enable the detection of a potential risk of aspiration with placement of the plan as potentially detrimental.

The ECG is reviewed by Dr. Mergency while Jean Careful coaxes Mr. Anyman to drink the charcoal. The ECG reveals a sinus tachycardia with a HR of 134, QRS of 110 ms, and QTc of 420 ms. The plan is updated and a bicarbonate drip is ordered from the pharmacy and a bolus of sodium bicarbonate ordered.

As that is being prepared, Mr. Anyman has a seizure. Execution of the care plan continues with a bolus of sodium bicarbonate ordered in response to the wide complex tachycardia that appeared shortly after the onset of the seizure. Dr. Mergency requests that the patient be prepared for intubation as he orders intravenous lorazepam to combat the seizure. The wide complex tachycardia converts into a sinus tachycardia after the first dose of sodium bicarbonate.

The patient is given intravenous fentanyl, lidocaine, and a low dose of vecuronium. The protocol order set includes an automatic request for respiratory therapy to set up a ventilator, arterial blood gases, and a portable chest radiography. After succinylcholine and 10 mg of midazolam the placement of the tube confirmed by EtCO2.

Once the last of the intubation plan items were completed, the ventilator management plan was finalized with ventilator settings and continued sedation. To monitor for recurrent seizures, the plan was adapted to exclude ongoing neuromuscular blockade.

Vital signs showed a continued sinus tachycardia with a HR of 136, BP of 102/62, SaO2 of 100% on FiO2 of 0.5 and MMV of 10L/min.

The bicarbonate infusion is begun at a rate of 150 cc/hr, and an orogastric tube is placed. Activated charcoal administered via the orogastric tube.

Repeat blood pressure measurement shows a HR of 132, BP 90/42. The care plan is adapted, as the decision support system advises rechecking a 12 lead ECG, and giving another bolus of bicarbonate if the QRS is widened. Otherwise a norepinephrine infusion is prepared and the care plan adapted to titrate to a MAP > 70. Blood gasses show a mixed respiratory and metabolic alkalosis with a pH of 7.5.

5.3.1.1.1.4.3 POST-CONDITION
The patient has a care plan in place accommodating multiple protocols and ordersets for the various treatments occurring. The patient is transferred to the ICU. The care plan is used to coordinate care.
5.3.2 Storyboard 3: Home Care

5.3.2.1 Short Description of the health issue thread covered in the storyboard

The purpose of this care plan storyboard on home-care is to illustrate the communication flow and documentation of a care plan between a patient, his or her primary care provider and the home health specialists involved in the rehabilitation efforts for a patient recovering from a stroke. This health issue thread (simplified) consists of five encounters, although in reality there could be many more encounters:

A. Hospital Discharge  
B. Ambulatory Rehabilitation Clinic Visit  
C. Home Health Visit  
D. Primary Care Visit  
E. Dietitian Visit

5.3.2.1.1 Storyboard Actors and Roles

- Hospital Attending Physician: Dr. Aaron Attend
- Primary Care Physician: Dr. Patricia Primary
- Patient: Eve Everywoman
- Occupational Therapist: Pamela Player
- Physical Therapist: Seth Stretcher
- Speech Therapist: George Speaker (not in HL7 list)
- Home Health Nurse (Not in HL7 list): Nancy Nightingale
- Dietitian: Connie Chow

5.3.2.1.1 ENCOUNTEN A: HOSPITAL DISCHARGE

5.3.2.1.1.1 PRE-CONDITION

Patient Eve Everywoman, a sixty-seven year old female is ready to be discharged from the hospital after having been diagnosed and treated for a stroke.

5.3.2.1.1.2 DESCRIPTION OF ENCOUNCNTER

Hospital Attending Physician Dr. Aaron Attend performs a discharge assessment to verify that patient Eve Everywoman is stable enough to be sent home. During the assessment Dr. Aaron Attend reconciles the medications to be continued or added (Note: sometimes meds are changed at discharge to something more appropriate to take at home – e.g. an oral alternative to a parental drug), outlines follow up information and discusses activities to continue at home. He has observed some relatively minor difficulties in walking and in speaking, and therefore recommends some rehabilitation activities with the Ambulatory Rehabilitation Clinic. As Dr. Aaron Attend and Eve Everywoman talk about the goals relating to the care plan at the rehabilitation clinic and at home, they determine that a home health skilled nurse would be crucial as a complement to the rehabilitation activities they have agreed upon. After the care
plan has been discussed and agreed to, Dr. Aaron Attend documents the care plan, asks that a referral request be sent to the Ambulatory Rehabilitation Clinic, and schedules a list of rehabilitation activities that are to be performed by a home health skilled nurse in parallel to the Ambulatory Rehabilitation Clinic activities (Note: Usually the nurses, physical and occupational therapists develop a plan and do not consult with the physician).

5.3.2.1.1.3 POST CONDITION
Once the care plan was updated, administrative personnel sent a request for services to the Ambulatory Rehabilitation Clinic with the patient hospital discharge summary and the care plan. A referral in the form of a notification was also sent to the home health agency notifying the agency of the need to have a home health nurse visit Eve Everywoman and help in her rehabilitation efforts. This was accompanied by a hospital discharge summary and the care plan. This same information was sent to the primary care provider. A copy of the care plan was also given to the patient and the patient was discharged to home.

5.3.2.1.2 ENCOUNTER B: AMBULATORY REHABILITATION CLINIC VISIT (IN PARALLEL TO HOME HEALTH VISIT)

5.3.2.1.2.1 PRE-CONDITION
The Ambulatory Rehabilitation Clinic has scheduled a first visit with patient Eve Everywoman to conduct a full assessment of Eve’s condition and to develop a detailed care plan. The case has been assigned to physical therapist Seth Stretcher as the interdisciplinary team lead. Seth has reviewed the information sent by Hospital Attending Physician Dr. Aaron Attend and has determined that 2 other professionals are needed in the assessment: Occupational Therapist Pamela Player and Speech Therapist George Speaker. He informs them of the case. He is aware from the care plan that a Home Health Nurse will be providing home care in parallel and that there will be a need for coordination of rehabilitation efforts with the home care nurse.

5.3.2.1.2.2 DESCRIPTION OF ENCOUNTER
Patient Eve Everywoman arrives at the Ambulatory Rehabilitation Clinic and is shown to an assessment room. Physical therapist Seth Stretcher introduces himself and starts a conversation to put Eve at ease. He reviews with her what she has gone through and the care plan prepared by Hospital Attending Physician Dr. Aaron Attend. He performs a preliminary assessment and records his observations and findings. He then informs Eve that he would like her to see 2 other professionals, Occupational Therapist Pamela Player and Speech therapist George Speaker. In turn, Pamela and George meet with Eve, record their observations and findings. The 3 professionals meet together, share their findings and agree on specific goals and treatments for the 3 areas of rehabilitation. Seth meets with Eve, discusses with her what they have found and what they feel the detailed rehabilitation care plan should be, explains the collaboration between the clinic and the home care nurse, answers her questions, addresses her concerns, and obtains agreement from her on the Ambulatory Rehabilitation Clinic care plan and schedule of activities. (Note: the OT could do a ‘home assessment’ to see what changes should be done to the home – carpets, grab bars and so on.)

5.3.2.1.2.3 POST CONDITION
A copy of the new care plan and schedule was given to the patient and the patient was sent home. An update to the original care plan was made. A copy of findings and the care plan and schedule were sent to the home health agency, and a request was made for close coordination of activities at the clinic and in the home. A summary of the information was sent as feedback to Primary Care Physician Dr. Patricia Primary and to Hospital Attending Physician Dr. Aaron Attend.
5.3.2.1.3.1 PRE-CONDITION
Home Health Nurse Nancy Nightingale, upon receiving the request from Dr. Attending, acknowledges receipt of the request, familiarizes herself with the discharge summary, and reviews the notes and activities that Dr. Attending desires to be completed in patient Eve Everywoman's rehabilitation efforts. A home health visit appointment is scheduled.

5.3.2.1.3.2 DESCRIPTION OF ENCOUNTER
During the first home visit, Home Health Nurse Nancy Nightingale takes a few minutes to introduce herself and gets to know patient Eve Everywoman. Nancy Nightingale uses the care plan as a reference as she visits with Eve Everywoman and discusses the rehabilitation efforts Dr. Attending desires. Included in the care plan is the platelet inhibitor and cholesterol reducing medications that Eve Everywoman was discharged on. Nancy Nightingale discusses any questions regarding the medications and any discharge orders that Eve Everywoman was sent home with. Nancy Nightingale takes a few minutes to perform a quick assessment including a basic set of vital signs and documents this in the appropriate area on the care plan. As Nancy Nightingale and Eve Everywoman talk about rehabilitation efforts, one of the goals that Eve Everywoman would like to work on emerges: it is about managing her weight. Nancy Nightingale documents this along with a set of realistic interventions and steps on weight management, including reducing the salt intake and taking the blood pressure regularly. Nancy shows Eve how to take her own blood pressure readings and how to record them. As Nancy Nightingale leaves this home health visit, she reminds Eve Everywoman of the goals they have discussed and the time of the next visit.

5.3.2.1.3.3 POST CONDITION
Home Health Nurse Nancy Nightingale sends an update to the care plan to record the weight management activities and the blood pressure reading instructions and training. During the next few weeks, Home Health Nurse Nancy Nightingale continues to make home visits to patient Eve Everywoman and assist in rehabilitation efforts. During each visit Nancy is able to reference the care plan and updates assessments and progress. The time has come for Eve to follow up with her primary care provider.

5.3.2.1.4 ENCOUNTER D: PRIMARY CARE VISIT

5.3.2.1.4.1 PRE-CONDITION
Patient Eve Everywoman is scheduled to meet with her primary care provider on a regular basis to assess her health and prevent future complications. Today is Eve Everywoman's first visit to Primary Care Physician Dr. Patricia Primary since her stroke occurrence and her discharge from hospital. Her primary care provider has been copied on the hospital discharge summary and the care plan.

5.3.2.1.4.2 DESCRIPTION OF ENCOUNTER
Primary Care Physician Dr. Patricia Primary reviews patient Eve Everywoman's hospital discharge summary and most recent care plan, and reviews the assessments and progress notes made over the last four weeks as well as the blood pressure recordings made by Eve. Dr. Patricia Primary notices that...
one of Eve Everywoman's goals is weight management. Dr. Patricia Primary congratulates Eve Everywoman on her weight loss over the last four weeks and also discusses the advantages of diet along with her exercise. She gains the approval of Eve Everywoman's to meet with a registered dietitian to consult on diet along with her exercise.

5.3.2.1.1.4.3 POST CONDITION
After patient Eve Everywoman leaves the office, Primary Care Physician Dr. Patricia Primary takes a few minutes to update the care plan and record progress notes, and copies the home care nurse on these. A week after Eve Everywoman's appointment with Dr. Patricia Primary, Home Health Nurse Nancy Nightingale visits Eve Everywoman. Nancy Nightingale again accesses the care plan and reviews the updates and progress notes from the appointment with Primary Care Physician Dr. Patricia Primary. Nancy Nightingale notices that Dr. Patricia Primary advised Eve Everywoman to consult with a Dietitian and asks Eve Everywoman if she needs any help scheduling that appointment. She adds notes to the care plan. (Note: usually a physician would send some kind of referral letter in association with the referral or notify the nurse to do that if the nurse and physician are in an interdisciplinary team.)

5.3.2.1.1.5 ENCOUNTER E: DIETITIAN VISIT

5.3.2.1.1.5.1 PRE-CONDITION
Due to the recommendation of patient Eve Everywoman's primary care provider to visit a dietitian, patient Eve Everywoman, with the help of her home health nurse scheduled an appointment. Home Health Nurse Nancy Nightingale sends an up to date care plan (or a link to a centrally hosted one in the EHR) to the dietitian. Eve Everywoman has arrived at the dietitian office for the scheduled appointment.

5.3.2.1.1.5.2 DESCRIPTION OF ENCOUNTER
The receptionist at the dietitian’s office takes a few moments to register patient Eve Everywoman and verify the identification information that was sent over with the care plan. The receptionist also updates the care plan with the additional nutrition information that Eve Everywoman was instructed to complete. Dietitian Connie Chow visits with patient Eve Everywoman and reviews the care plan including the additional nutrition information that was just updated. After reviewing this information and through the discussion with Eve, Connie Chow is able to assess Eve’s current state of nutrition habits and health. Connie Chow makes specific recommendations for Eve and notes them in the care plan.

5.3.2.1.1.5.3 POST CONDITION
Dietitian Connie Chow gives to patient Eve Everywoman a copy of the care plan with diet recommendations and recommends her to return for a follow up appointment in a couple of weeks. Connie Chow re-emphasizes the importance of maintaining a good diet to prevent other strokes from occurring. A progress note is also sent to the home health nurse and to Dr. Patricia Primary updating the events of the appointment.

5.3.2.1.1.5.4 ABOUT COORDINATION OF CARE
In this storyboard, the initial coordination of care provided by all providers would be under the responsibility of the hospital attending physician; however, in most places, the responsibility ends when the patient is discharged. This coordination role would then be transferred formally to the primary care
physician who may work with a community care coordinator. However, there could exist a shared coordination role between the primary care physician and the lead at the Ambulatory Rehabilitation Clinic.

5.3.3 Storyboard 4: Pediatric Allergy

5.3.3.1 Short Description of the health issue thread covered in the storyboard

The purpose of the Pediatric Allergy storyboard is to illustrate the communication flow and documentation of a pediatric care plan to ensure good communication among team members (consisting of diverse health care professionals, caregiving parent, and child) along with development of the care plan and education to promote adherence to the care plan. This health issue thread consists of four encounters:

A. Primary Care Physician Initial Visit for Seasonal Allergy and Cough
B. Allied Health Care Provider Visit
C. Visit to Allergist (Specialist Physician) by referral from PCP
D. Primary Care Follow-up Visit

5.3.3.1.1 Storyboard Actors and Roles

- Patient: Kari Kidd
- Caregiver (Mother): Nelda Nuclear
- Primary Care Provider (Pediatric Nurse Practitioner): Amanda Assigned, NP
- Medical Specialist (Allergist): Richard Reaction, MD
- Pharmacist: Susan Script
- Primary Care Provider (Pediatrician): Patricia Primary, MD
- Office Manager: unnamed actor

5.3.3.1.1.1 ENCOUNTER A: PRIMARY CARE PHYSICIAN INITIAL VISIT FOR SEASONAL ALLERGY AND CONTACT DERMATITIS

5.3.3.1.1.1.1 PRE-CONDITION

Patient Kari Kidd has been sneezing and sniffling for a week as she did at this same time last year. She also has a cough that awakens her most nights and started soon after her sneezing. She complains of being tired and refuses to participate in her after school sports activities, which also seem to bring out her cough. In the mornings she has a sore throat and headache. Mother decides Kari needs to be seen and calls their primary care office for a same day appointment.

5.3.3.1.1.2 DESCRIPTION OF ENCOUNTER

As is customary for the practice, Kari is examined by the Nurse Practitioner, Amanda Assigned. NP Assigned takes a history and learns that the symptoms are worse this spring and that the cough is a new development. NP Assigned is aware the pollen count has been exceptionally high for the past week. She asks if Kari usually gets “cold symptoms” in the spring. Mother and daughter nod in agreement. Headache, sore throat, and morning mucus are described as occurring every spring. NP Assigned diagnoses seasonal allergies to pollen. She prescribes a nasal corticosteroid spray, two squirts once a day in each nostril and recommends loratadine 10 mg daily. She tells Kari it is ok to use an over-the-counter analgesic such as acetaminophen or ibuprofen for the headache. She refers Kari to an allergist
because her symptoms were much worse this year than in previous seasons and the cough, which may be an asthma variant, has developed this year. NP Assigned sends the pharmacy an e-prescription for the nasal corticosteroid spray. She also suggests they stay a few more minutes to learn proper use of the nasal spray.

5.3.3.1.1.1.3 POST CONDITION
The chief complaint of the visit diagnosis written into Kari’s medical record is: Seasonal rhinitis stemming from allergy to pollen and possible cough variant asthma.

A referral is processed to Richard Reaction, MD for assessment of allergies and the appointment scheduled. A clinical summary is sent along with the referral request.

A care plan is started in the EHR: patient referred to home-based self-care supervised by care-giving parent (Mother).

The prescription medication orders are conveyed to the pharmacy designated by the patient’s mother electronically after doing an insurance coverage check to verify coverage for the prescribed medication.

The care plan is updated by NP Assigned: Patient and care-giver medication self-administration education delivered. Patient and Caregiver evidenced comprehension by return demonstration and verbal summary of plan by patient and caregiver.

Medication List is updated with OTC prescribed and prescription medications. The date of next visit is also determined. The Mother and Patient thank NP Assigned and head to the pharmacy.

5.3.3.1.1.2 ENCOUNTER B: ALLIED HEALTH CARE PROVIDER VISITS

5.3.3.1.1.2.1 PRE-CONDITION
Pharmacist Susan Script meets the Patient and her Mother to ensure they know how to use the medication safely, and answer any questions.

5.3.3.1.1.2.2 DESCRIPTION OF ALLIED HEALTH CARE PROVIDER ENCOUNTER - PHARMACY
Susan asks Kari if she has ever taken either medication. She tells Kari the medication she will receive is called fluticasone propionate nasal spray as well as the non-prescription loratadine pill.

5.3.3.1.1.2.3 POST CONDITION
An updated care plan complete with action items and target dates is completed with patient agreement. It focuses on symptomatic management of seasonal allergy emphasizing the prevention strategy developed this visit.

The patient is given a copy of the new care plan.

A progress note is written which documents the outcomes of the management, any risks identified and changes/new management strategies required. The patient summary is updated and this progress note is
routed to the patient’s primary care provider, Dr. Primary. Any care coordination responsibilities required of Dr. Primary are also communicated to her.

<table>
<thead>
<tr>
<th>Provider/ Allied Health Provider</th>
<th>Encounter Activities</th>
<th>Outcomes</th>
<th>Communications</th>
</tr>
</thead>
</table>
| Nurse Practitioner              | Review referral/patient progress  
Diagnose and treat.  
Assess learning needs and strategy  
Discuss and finalize education plan  
Discuss and update care plan and patient summary | Articulate a mutually agreed upon care plan.  
Verify comprehension of education plan  
Update clinical notes and patient summary  
Generate progress notes | Summary care plan and progress note medical record to primary care provider and to others, e.g. patient’s PHR, specialist, etc. |
| Pharmacist                      | Review prescription  
Assess medication and other pharmaceutical therapy needs and strategies  
Check for and answer questions about use of medications, contraindications or side effects. | Update care plan if anything unusual or concerning is noted if pharmacy is part of the same organizational entity. | New/updated care plan to patient and PHR if there are any changes to prescription or care plan. |
| Allergy Specialist Physician    | Review referral/patient progress  
Assess symptoms and medication needs and strategies. Decide if skin testing should be done  
Discuss and finalize allergy care plan | Review results of skin tests. Develop/update allergy care plan  
Update clinical notes  
Generate progress notes | New/updated allergy care plan to patient and PHR.  
Summary care plan and progress note to primary care provider and to others, e.g. NP, pharmacist, etc. |
| Primary Care Physician          | Review referral/patient progress  
Assess overall care needs and strategies  
Discuss and finalize care plan with NP as needed and with the patient and Mother at next encounter. | Develop/update care plan with targeted prevention elements for seasonal symptom reduction  
Update clinical notes  
Generate progress notes | New/updated care plan to patient  
Summary care plan and Progress note to medical record and to others, e.g. Specialist, NP, patient and Mother (PHR), etc. |

Table 3. Provider and Allied Health Provider Encounters – Activities and Outcomes

5.3.3.1.1.3 ENCRYPTION C: VISIT TO ALLERGIST (SPECIALIST PHYSICIAN) THREE MONTHS LATER

5.3.3.1.1.3.1 PRE-CONDITION
Dr. Richard Reaction receives a referral for evaluation of allergy from the patient’s Nurse Practitioner.
5.3.3.1.1.3.2 DESCRIPTION OF ENCOUNTER
Dr. Reaction reviews the referral request, obtains a history from Kari and her mother, and performs a physical exam. He also orders a pulmonary function test by his staff and skin testing to relevant inhalant allergens. When the testing is over, Dr. Reaction meets Kari and Nelda in his office where he explains the results. They confirm NP Assigned’s diagnosis of seasonal allergy and explains the results of the skin tests. Dr. Reaction also advises that the normal pulmonary function test results are consistent with a diagnosis of cough variant asthma, a mild form of asthma. He makes a recommendation to treat the symptoms with daily use of a controller medication, an inhaled corticosteroid, to control symptoms and to reduce the potential to progress to more significant asthma. He also explains that Kari is allergic to grass and oak pollen. He provides handouts about what to do if you have allergies explaining that if you keep the doors and windows shut, there is essentially no pollen indoors.

He provides Nelda with a copy of the results of the pulmonary function tests and the allergy testing that she has requested.

5.3.3.1.1.3.3 POST CONDITION
Dr. Reaction completes a consult note, including Kari’s allergy care plan that includes asthma management. He transmits a copy of this to NP Assigned as the referring provider and to Dr. Primary as Kari’s primary care provider.

A copy of the consult note and allergy care plan is sent to Kari’s mother also.

Prescriptions for the nasal corticosteroid and the inhaled corticosteroid are sent to the pharmacy specified by Nelda with refills sufficient to last until a follow up visit in 2 months. The allergy care plan calls for these medications to be suspended at that time if symptoms are absent and a follow-up visit with Dr. Reaction just prior to the allergy season next year. If symptoms reappear before that time, Nelda is to contact Dr. Reaction.

Upon receipt of her copy Amanda updates Kari’s care plan, including her list of active medications. She adds Kari to the list of patients who are to be scheduled for an annual influenza vaccination as recommended in Dr. Reaction’s allergy care plan.

5.3.3.1.1.4 ENCOUNTER D: PRIMARY CARE FOLLOW-UP VISITS

5.3.3.1.1.4.1 PRE-CONDITION
Office Manager:
- Schedules an annual influenza immunization reminder. The practice will send out their letters to all patients who need them the same week advising of which days and times are available for an office nurse visit to get the vaccination.

5.3.3.1.1.4.2 DESCRIPTION OF ENCOUNTER
Nelda receives a reminder to book Kari’s next annual visit. She books the visit and brings Kari to the practice to meet with Dr. Primary.

Primary Care Physician Dr. Patricia Primary reviews Kari’s progress, and makes changes after conferring with Kari and her mother and getting agreement on her new recommendations. This time Kari expresses continuing health and only minor problems adhering to and benefitting from the seasonal allergy control strategy and control of her cough variant asthma. The care plan is updated to reflect well-controlled seasonal allergy.
5.3.3.1.1.4.3 POST CONDITION
The practice reminder system is updated with the request to book the annual visit three months prior and to send the patient a reminder of the visit date two weeks before the next office visit.

5.3.4 Storyboard 5: Pediatric Immunization

5.3.4.1 Short Description of the health issue thread covered in the storyboard
The pediatric immunization storyboard illustrates the documentation of a care plan and communication in a well child visit involving patient, parent and doctor. This health issue thread consists of three encounters:

A. Annual well child visit with initial vaccination (injection 1 of 3)
B. Return visit for first booster injection (injection 2 of 3)
C. Return visit for second booster injection (injection 3 of 3)

Coordination of care is triggered by the physician's recommendation for a three dose vaccine series. Other actions include use of the medical office reminder system, the three interventions (injections), as well as documentation.

5.3.4.1.1 Storyboard Actors and Roles
- Patient: Ned Nuclear
- Caregiver (Mother): Nelda Nuclear
- Primary Care Provider Patricia Primary, MD (PCP)
- Registered Nurse: Nancy Nightingale, RN
- Office Manager: unnamed actor

5.3.4.1.1.1 ENCOUNT A: ANNUAL WELL CHILD VISIT WITH INITIAL VACCINATION (INJECTION 1 OF 3)

5.3.4.1.1.1.1 PRE-CONDITION
Ned Nuclear, a child enrolled in Dr. Patricia Primary’s pediatric practice arrives to register for his annual well child visit. At the appropriate point in the encounter, she reviews immunizations he is eligible for. The Pediatrician notes that his age makes him eligible for immunization against human papilloma virus (HPV). *

5.3.4.1.1.1.2 DESCRIPTION OF ENCOUNTER
After the immunization plan is discussed and agreed to and after allergies are verified, Dr. Primary documents in the care plan. She also documents vaccine lot number of the dose in the narrative health record. She hands the parent the VIS for HPV vaccine. Dr. Primary records the version date for this VIS and records the date presented. She records the target disease (HPV) for the VIS as the document type. (This may be done by a clinical staff person.) The mother is asked if the child fits into one of the categories that would make him eligible for special funding programs, such as vaccines programs for children. Her answers are recorded. Then, Dr. Primary or a clinical staff member gives the injection and documents in the patient's record “HPV 1 of 3 given, follow-up in two months for number 2 of 3.” The information is entered in the Immunization section of the care plan. Then Dr. Primary or the clinical staff person transfers the information to the patient’s pocket immunization document Ned’s mother brought to
the visit. Dr. Primary asks patient and mother to schedule a follow up visit in 1-2 months for the next dose in the immunization series.

5.3.4.1.1.3 POST CONDITION

An appointment is scheduled for the second immunization and a notification is set to remind Nelda by email of the coming appointment 48 to 72 hours before it starts.

5.3.4.1.1.2 ENCOUNTER B: RETURN VISIT FOR FIRST BOOSTER INJECTION (INJECTION 2 OF 3)

5.3.4.1.1.2.1 PRE-CONDITION

Scheduled visit for number 2 of 3, i.e., the second dose of three dose immunization series two months after the initial dose. Today is Ned’s appointment at the primary care practice for his HPV booster.

5.3.4.1.1.2.2 DESCRIPTION OF ENCOUNTER

Ned and his mother arrive in the primary care office for his first HPV booster immunization. Nancy Nightingale, RN greets them and shows them in to the exam room. She asks if Ned experienced any side effects from the vaccine when he last received it. Ned’s mother reports Ned experienced a sore arm only, lasting a day. Nancy documents this in the narrative record as interdisciplinary notes. Dr. Primary sees Ned and his mother and it is agreed Ned will continue on the immunization schedule. Nancy comes back into the room to administer the booster vaccine. She documents the vaccine lot number of the dose in the narrative health record. She hands the parent the VIS for HPV vaccine. Nancy records the version date for this VIS and records the date presented. She records the target disease (HPV) for the VIS as the document type. Nancy gives the injection and documents in Ned’s record “HPV 2 of 3 given, follow-up in two months for number 3 of 3.” The information is entered in the Immunization section of the care plan. Then Nancy transfers the information to the patient’s pocket immunization document Ned’s mother brought to the visit. Dr. Primary asks patient and mother to schedule a follow up visit in 1-2 months for the next dose in the immunization series.

5.3.4.1.1.3 POST CONDITION

Nancy updates the care plan. Ned and Nelda make the final appointment on their way out.

5.3.4.1.1.3 ENCOUNTER C: RETURN VISIT FOR SECOND BOOSTER INJECTION (INJECTION 3 OF 3).

5.3.4.1.1.3.1 PRE-CONDITION

Ned and Nelda receive their reminder notices of appointment for Ned’s third HPV vaccine injection.
5.3.4.1.1.3.2 DESCRIPTION OF ENCOUNTER
Ned and Nelda arrive as scheduled. Nancy Nightingale, RN checks for reaction to the previous booster. Hearing there was none, she gives the third injection and documents in Ned’s record “HPV 3 of 3 given; sending Ned and Mom on their way in five minutes after asking if they have any other needs or concerns.

Office management protocols for next scheduled visit are invoked.

5.3.4.1.1.3.3 POST CONDITION
Updating the Immunization Section of the care plan:

A visit reminder will be e-mailed to Nelda and mailed to Ned (their chosen communication methods) two days before the next annual visit date.

The immunization is submitted to the clinical / immunization registries in the jurisdiction.

5.3.4.1.1.3.4 ABOUT COORDINATION OF CARE
In this storyboard, the coordination of care provided is under the responsibility of the pediatrician who may work with an office nurse or a medical assistant trained to this task of vaccine booster visits. Coordination also depends on the scheduling and reminder systems.

The following sections present general observations about the coordination of care in similar situations, and present various models of care coordination.

5.3.5 Storyboard 6 – Perinatology

5.3.5.1 Short Description of the Health Issue Thread covered in the Storyboard

The purpose of the Perinatology story board is to illustrate the communication flow and documentation between a patient and various collaborating care team members (i.e. diverse health care professionals) involved for a patient experiencing pregnancy, labor and delivery). This storyboard describes four (4) major encounters in this health issue thread, each encounter being presented with its pre and post conditions and specific activities:

A. First pregnancy visit
B. Post ultrasound visit
C. First Perinatologist visit
D. Giving Birth

Patient Eve Everywoman experiences her first pregnancy. She initiates prenatal care with Obstetrician/Gynaecologist (OB/Gyn) specialist who follows Eve’s pregnancy until a complication develops. At that time Eve’s prenatal care is transferred to a perinatologist who provides Eve’s prenatal care until her delivery. The perinatologist maintains close communication with the OB/Gyn throughout the prenatal period and attends the delivery of the baby. The OB/GYN specialist delivers the baby. Care is coordinated throughout the health issue thread across several care settings and several care providers/givers.
Information gathered and included in the Health Record and in documents transferred between caregivers includes demographics, physical findings (e.g. VS including weight) and test results (e.g. laboratory, radiology and other diagnostic testing results).

5.3.5.1.1 Storyboard Actors and Roles

- OB/Gyn Physician: Dr. Flora Fem
- Perinatologist: Dr. Patricia Perinatologist
- Patient: Eve Everywoman
- Receptionist: Ruth Receptionist
- OB/Gyn Office Medical Assistant: Melissa MedAssist, MA
- Perinatologist Office Medical Assistant: Mandy MedHelp, MA
- Next of kin – patient’s husband: Neville Nuclear
- Labor and Delivery Registered Nurse 1: Nancy Nightingale
- Labor and Delivery Registered Nurse 2: Lilly Labornurse

5.3.5.1.1.1 ENCOUNTERT A: FIRST PREGNANCY VISIT

5.3.5.1.1.1.1 PRE-CONDITION
Patient Eve Everywoman is a 28-year-old high school teacher. She and her husband of two years have recently suspected she is pregnant with their first child. Eve has confirmed her suspicions with the use of an over the counter pregnancy test and has scheduled an appointment with the OB/Gyn Physician Dr. Flora Fem.

5.3.5.1.1.1.2 DESCRIPTION OF ENCOUNTER
Patient Eve Everywoman is excited for the first Dr’s visit after finding out she is expecting her first child. Eve Everywoman has checked into the OB/Gyn office for her first visit and is waiting to be called back to the exam room. Eve has completed the new patient history form at home (after having downloaded and printed the form from the OB/Gyn Office website as directed when making her appointment). When Eve made her appointment, a patient record for Eve was initiated. The OB/Gyn office Medical Assistant, Melissa MedAssist comes to the waiting room and asks Eve to follow her back to the exam room. Melissa MedAssist measures Patient Eve Everywoman’s weight and blood pressure. These measurements are entered into the patient record. Melissa MedAssist also enters the information provided by Eve on the new patient history form into the patient record. OB/Gyn Physician Dr. Flora Fem enters the room and greets Patient Eve Everywoman. Dr. Flora Fem reviews the information is Eve’s patient record and performs both a subjective and objective assessment. During the assessment Dr. Fem evaluates Eve’s diet, activity and symptoms of pregnancy. OB/Gyn Dr. Flora determines Eve’s diet to be adequately nutritional for a pregnancy and encourages her to continue moderate exercise during the pregnancy. Dr. Fem determines Eve’s symptoms of pregnancy are mild and currently manageable by Eve at home. Dr. Fem recommends prenatal vitamins and provides Eve with a list of resources for early pregnancy education. Fem updates any new or additional information brought up during the visit in the patient record and updates Eve’s Perinatal care plan with items relevant to her current pregnancy.
5.3.5.1.1.1.3 POST-CONDITION
Dr. Flora Fem provides Patient Eve with a copy of the updated Perinatology care plan and reviews it with her. The next visit is scheduled and Patient Eve Everywoman is feeling confident about the care plan discussed during the appointment.

5.3.5.1.1.2 ENCOUNTER B: POST ULTRASOUND VISIT

5.3.5.1.1.2.1 PRE-CONDITION
Patient Eve Everywoman’s 1st pregnancy has been uneventful. Eve has continued to feel well has not experienced negative symptoms of pregnancy such as nausea. She and her husband are thrilled to be starting a family and have been busy preparing a nursery. After the sixteenth week, Eve Everywoman went to get a routine ultrasound and has returned to OB/Gyn Physician, Dr. Flora Fem’s office for a follow up visit.

5.3.5.1.1.2.2 DESCRIPTION OF ENCOUNTER
Medical Assistant, Melissa MedAssist escorts Patient Eve Everywoman to the exam room stopping to check Eve’s weight along the way. Once in the room Melissa MedAssist also checks Eve’s blood pressure, respiratory rate, pulse, temperature and pulse ox. Dr. Flora Fem enters the room and reviews the updates to the patient record and the results of the ultrasound performed last week. Dr. Flora Fem asks Eve how she has been feeling does a quick assessment, including a Doppler assessment of the fetal heart tones. Dr. Flora Fem enters her findings into the patient record. Dr. Flora Fem has some concerns about a few of the findings associated with the ultrasound. Dr. Flora Fem has a referral relationship with Dr. Patricia Perinatologist and discusses the benefits of the additional care a Perinatologist can provide with Eve Everywoman. Dr. Flora Fem schedules a referral appointment, and updates the Perinatology care plan with the new problem indicated by the ultrasound report and the steps agreed upon with the patient Eve Everywoman to see the perinatologist. Dr. Flora Fem also reviews the data contained in the patient Perinatology care plan to ensure all data is up to date and includes the relevant/pertinent VS and physical exam findings of today’s visit. When the Perinatology care plan is updated a message is sent in the form of a notification to Dr. Patricia Perinatologist with the intent of Patient Eve Everywoman to schedule an appointment. As part of the notification, the message includes a copy of the Perinatology care plan.

5.3.5.1.1.2.3 POST-CONDITION
Dr. Flora Fem provides Patient Eve with a copy of the updated Perinatology care plan and reviews it with her. Patient Eve Everywoman schedules an appointment with Dr. Patricia Perinatologist. Dr. Patricia Perinatologist is able to access the Perinatology care plan and can see the documents relating to Patient Eve Everywoman’s care plan up to this point. The Patient record and Perinatology care plan is up to date with the recent data.

5.3.5.1.1.3 ENCOUNTER C: FIRST PERINATOLOGIST VISIT

5.3.5.1.1.3.1 PRE-CONDITION
Patient Eve Everywoman continues to feel well and not experience negative symptoms of pregnancy. She and her husband are concerned about their baby and the results of the ultrasound requiring a referral to the Perinatologist. Patient has arrived with her husband at the perinatologist office for the scheduled
appointment. OB/Gyn Physician Flora Fem’s office has provided Perinatologist Dr. Patricia Perinatologist with pertinent information from Eve Everywoman’s patient record.

5.3.5.1.1.3.2 DESCRIPTION OF ENCOUNTER
The Perinatologist Office Medical Assistant, Mandy MedHelp, escorts patient Eve Everywoman and her husband Neville Nuclear to the exam room. Mandy MedHelp measures Eve’s weight, blood pressure, pulse, and fetal heart rate and records them in the Patient Record. Mandy MedHelp finds the results from Eve’s 16-week ultrasound and makes them readily accessible to Perinatologist Dr. Patricia Perinatologist. Dr. Patricia Perinatologist enters the room and greets Eve and her husband Neville. Dr. Perinatologist reviews Eve’s patient record and performs a subjective and objective assessment. Dr. Perinatologist updates the patient record with her findings. Dr. Patricia Perinatologist explains to Eve and her husband the sixteen-week ultrasound indicated the fetus is small for its gestational age and that the umbilical cord is only a 2-vessel cord instead of three. Dr. Patricia Perinatologist explains these findings are something to watch carefully, but that Eve and Neville could still have a healthy baby. Dr. Patricia Perinatologist explains to Eve and Neville the importance for Eve to maintain a good diet, exercise routine and other healthy habits during the pregnancy. She makes specific recommendations for Eve and notes them in the care plan.

5.3.5.1.1.3.3 POST-CONDITION
Dr. Patricia Perinatologist gives a copy of the care plan with diet and activity recommendations noted as well as a couple of patient handouts with instructions that are more specific and suggestions listed to Eve Everywoman. Dr. Patricia Perinatologist recommends Eve to return for a checkup in two weeks. The findings and recommendations of Dr. Patricia Perinatologist are made available to Dr. Flora Fem. OB/Gyn Dr. Flora Fem also has access to the updated CP and is alerted the plan has been updated appropriately.

5.3.5.1.1.4 ENCOUNTER D: GIVING BIRTH

5.3.5.1.1.4.1 PRE-CONDITION
Eve Everywoman’s pregnancy commences without further events. She continued to see Dr. Patricia Perinatologist every two weeks for the remainder of her pregnancy. It is determined that both she and the baby are healthy enough to attempt a vaginal delivery at the hospital where C-section facilities are available if the baby would begin to show distress. The patient record and CP are maintained at each visit, and a progress note is also sent every time to the referring OBGYN. Arrangements are made, and Eve Everywoman completes her hospital pre-registration for delivery. This allows the up to date patient record and Perinatology care plan to be accessible to the labor and delivery suite. At her last visit, the baby was estimated to be 5.5 lbs.

5.3.5.1.1.4.2 DESCRIPTION OF ENCOUNTER
Eve Everywoman begins to go into labor on the 5th day of her 39th week of gestation. Eve Everywoman calls the L&D unit where she has pre-registered for her delivery and tells them she believes she is in labor and on her way as she was directed at the pre-registration period.

Nancy Nightingale, the L&D nurse assigned to care for Eve Everywoman upon notice of her impending arrival accesses Eve’s patient record and Perinatology care plan. Nancy Nightingale prepares a room for Eve Everywoman according to the anticipated needs for Eve’s labor and delivery. Eve arrives and settles into the room prepared for her with assistance from Nurse Nancy. During the admission process, Nurse Nancy obtains Eve’s current weight and vital signs including temperature, pulse, respiratory rate, blood pressure, and oxygen saturation. Nancy also starts an intravenous line and attaches a fetal monitor to evaluate the frequency and strength of Eve’s contractions and the baby’s response to them. Nancy orients Eve and her husband Neville to the room and reinforces their prenatal education regarding what to expect during the labor and delivery process. Nancy does an objective and subjective physical assessment. During the admission process and after the flurry of hands on activities caring for Eve,
Nancy updates the patient record with her findings and notes the interventions done. Nancy also updates Eve’s labor and delivery care plan to include items specific to the Labor and Delivery Process. Nurse Nancy notifies Perinatologist Dr. Patricia Perinatologist of Eve’s arrival in the labor and delivery department. Nurse Nancy continues to monitor and support Eve throughout Eve’s laboring until her shift ends. Dr. Perinatologist arrives to do an objective and subjective assessment including a pelvic exam for Patient Eve and reviews the updated patient record and Labor and Delivery care plan. Dr. Perinatologist also makes updates to the patient record and Labor and Delivery care plan noting her findings. When Nurse Nancy’s shift ends, she reviews Eve’s progress and care provided unto that time with the oncoming nurse Lilly Labornurse. Lilly Labornurse reviews Eve’s updated patient record and Labor and Delivery care plan. Lilly Labornurse continues the monitoring and supportive care to Eve during her labor and through delivery. Lilly Labornurse updates the patient record and Labor and Delivery care plan as needed.

5.3.5.1.1.4.3 POST CONDITION
After 10 hours of progressive labor, Eve delivers a healthy 5 lb. 2-ounce baby girl. The patient record contains all records related to Eve’s pregnancy, labor, delivery and hospital post-partum care. A new patient record is also now available for the baby and contains all relevant delivery and newborn care information. Eve’s Postnatal care plan is up to date with goals towards healthy post-partum recovery. A Healthy Baby care plan is created for the baby with focus towards healthy newborn care, required screenings, scheduled immunizations and growth and development monitoring. The up to date summary reports and care plan (Postnatal and Healthy Baby) are provided to Eve. The updated coordination of care documents (summaries and care plan) are available to all of Eve’s and the baby’s caregivers as appropriate for care assignments. Each caregiver is appropriately alerted and the documents have been updated. Follow up appointments for Eve are made with the OB/Gyn specialist. Follow up appointments are made for the baby with a Pediatrician.

5.3.6 Storyboard 7 – Stay Healthy/Health Promotion

5.3.6.1 Short Description of the Health Issue Thread covered in the Storyboard
The purpose of the Stay Healthy – Health Promotion care plan storyboard is to illustrate the communication flow and documentation of a care plan between a patient, his or her primary care provider and the other specialists involved in health prevention. This health issue thread (simplified) consists of 7 encounters, although in reality there could be many more encounters:

A. Visit to Primary Care Physician  
B. Dietitian Visit  
C. Follow Up Dietitian Visit  
D. Primary Care Follow Up

5.3.6.1.1 Storyboard Actors and Roles
- Primary Care Physician: Dr. Patricia Primary  
- Patient: Adam Everyman  
- Dietitian: Connie Chow
5.3.6.1.1.1 ENCOUNTR A: VISIT TO PRIMARY CARE PHYSICIAN

5.3.6.1.1.1 PRE-CONDITION
Adam Everyman, a sixty year old male has been feeling tired, with frequent headaches and general discomfort. It has been over a 2 years since his last checkup. Due to weight gain over the past few years, he has been reluctant to return. He makes an appointment with his primary care physician Dr. Patricia Primary. The office requested that he be fasting for the appointment for lab work.

5.3.6.1.1.2 DESCRIPTION OF ENCOUNTER
Adam Everyman arrives at his physician’s office where he is weighed, has his blood pressure taken and is asked to fill out a health history. Dr. Patricia Primary enters the exam room and reviews Adam’s chart as well as today’s measurements. She notes a weight gain of 20 lbs. (9.1 kg) over the past two years. Blood pressure reading was 130/80, increased since the last visit as well. She does congratulate Adam for quitting and not smoking for the last 10 years. Dr. Primary orders screening blood work as well as a total cholesterol panel and HbA1c. Dr. Primary also discusses the risk of heart disease, stroke, and diabetes with his current weight and blood pressure. She writes an exercise prescription that includes gradually more exercises, starting with 30 minutes of walking daily outside of his normal activities. She recommends that Adam visit a registered dietitian to discuss improving his eating habits. She requests a follow up visit in three months to check progress. Lab work was drawn and Adam left with a referral to the dietitian.

5.3.6.1.1.3 POST ENCOUNTER VISIT
Dr. Primary Care summarized the visit for the patient’s record, including updates to Adam’s health history, lab tests ordered, as well as the referral to the registered dietitian. She asks the office to send a copy of the care plan that includes the above information as well as lab results and plans for follow up to Connie Chow, RD.

Adam’s lab values return the same week. Dr. Primary Care calls Adams with the results that indicate Total Cholesterol level 260, LDL 240, HDL 50, and triglycerides 190. His HbA1c level was 7. Dr. Primary explained that the current lab values put him at an increased risk of heart disease and stroke. She reinforces the need to follow up with the dietitian and exercise program.

5.3.6.1.2 ENCOUNTR B: DIETITIAN VISIT

5.3.6.1.2.1 PRE-CONDITION
Adam Everyman calls Connie Chow RD’s office to schedule an appointment after hearing the results of his lab tests. The office asks him to keep a food diary for three days and offer to email him a sample form. Adam does have an active email account and provides his email address.

5.3.6.1.2.2 DESCRIPTION OF ENCOUNTER
Adam Everyman arrives at his first visit with Connie Chow, RD. She quickly scans the food diary as well as the information provided by Dr. Primary Care’s office. She also questions Adam further regarding his food preferences, cooking methods, and interest in changing his eating habits. Connie Chow notes that his weekday breakfast and lunch meals are appropriate, but that he needs to rethink the portion sizes at dinner and his snacks. A meal plan is developed to promote weight loss of 0.5 lbs. (0.23 kg) per week. She is pleased to learn that Adam also has an exercise plan from his physician. Adam leaves with a copy of Connie Chow’s nutrition recommendations and an appointment for next month.
5.3.6.1.1.2.3 POST CONDITION
Connie Chow completes her assessment and nutrition care plan on Adam Everyman and sends a copy to Primary Care Physician Dr. Patricia Primary. She recommends monthly follow up for the first three months, then cutting back to every three months until Adam achieves his goals of weight loss and lower blood pressure.

5.3.6.1.1.3 ENCOUNTER C: FOLLOW UP DIETITIAN VISIT

5.3.6.1.1.3.1 PRE-CONDITION
Adam has continued to follow the diet guidelines outlines by Connie Chow most of the time. He arrives for his one-month follow up visit.

5.3.6.1.1.3.2 DESCRIPTION OF ENCOUNTER
Adam’s weighs 2.2 lbs. (1 kg) less than his first visit. Connie Chow congratulates him on the weight loss. Adam admits that he has not followed the meal plan perfectly, but has been exercising 3-4 times weekly. Connie reviews what parts of the diet work and which parts need some adjustment. They discuss appropriate choices when dining out, one of Adam’s downfalls. Connie asks to see him in one month. She invites his wife along to discuss cooking techniques as well. Updates to the diet plan are given to Adams. Another visit is scheduled in two months.

5.3.6.1.1.3.3 POST CONDITION
Connie Chow updates her care plan with weight loss progress as well as new goals for healthy eating when out and including wife in cooking discussion next month. This nutritional plan is shared with Dr. Primary Care.

5.3.6.1.1.4 ENCOUNTER D: PRIMARY CARE FOLLOW UP

5.3.6.1.1.4.1 PRE-CONDITION
Adam Everyman continues his exercise program and is following his meal plan. After 3 months, he has lab work redone prior to his doctor visit and he returns to his Primary Care MD.

5.3.6.1.1.4.2 DESCRIPTION OF ENCOUNTER
Dr. Primary reviewed the lab values and again explained that they have improved compared to the initial values. She asked about the dietitian visits and was pleased that he was trying to follow the recommended meal plan. She was also pleased to learn that he was working out three times a week at a gym close to his work and on Saturdays at a gym close to his home. Adam admitted that he was sore the first few weeks, but now was afraid to stop, as he did not want to start over. Dr. Pricilla Primary Care applauded his progress and suggested another follow up visit in six months with another blood draw.
5.3.6.1.1.4.3 POST CONDITION
Patient Adam Everyman makes appointment with Dr. Primary for a follow up visit in three months. Dr. Primary updates Adam’s care plan with a summary of the visit, recent lab work and measurements, noting Adam’s positive attitude. A copy is sent to his dietitian, Connie Chow.

5.3.7 Storyboard 8 – Case Management/Disease Management Care Coordination

5.3.7.1 Background
This storyboard was developed from the health insurer perspective. The storyboard includes concepts that may have different definitions across the industry and in different realms, such as disease management, case management, care management, and care manager. Within the context of this storyboard, the meaning of these concepts are defined below. The definitions originate from, “Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination)”, available at: http://www.ncbi.nlm.nih.gov/books/NBK44012/

Disease Management
The Disease Management Association of America defines this term as “a system of coordinated healthcare interventions and communications for populations with conditions in which patient self-care efforts are significant. Disease management supports the physician or practitioner/patient relationship and plan of care, emphasizes prevention of exacerbations and complications utilizing evidence-based practice guidelines and patient empowerment strategies, and evaluates clinical, humanistic, and economic outcomes on an ongoing basis with the goal of improving overall health.” Full-service disease management programs include the following six components: 1. processes to identify specific population, 2. evidence-based practice guidelines, 3. practice models based on collaboration between physicians and other supporting service providers, 4. self-management education for patients, 5. measurement of process and outcomes, and 6. routine reporting to provide a feedback loop among participants. In addition, disease management and case management programs have been included together under the umbrella of “coordinated care models” in reports intended to guide the Medicare Coordinated Care Demonstration Projects.

Case Management
The Case Management Society of America defines case management as “a collaborative process of assessment, planning, facilitation and advocacy for options and services to meet an individual's health needs through communication and available resources to promote quality cost-effective outcomes”. According to a Mathematica report that included case management in its definition of care coordination, “case management implicitly enhances care coordination through the designation of a case manager whose specific responsibility is to oversee and coordinate care delivery [targeted to] high-risk patients [with a] diverse combinations of health, functional, and social problems.”

Care Management
This term care management is often used interchangeably with care coordination. In a background paper, Mechanic states “care management programs apply systems, science, incentives, and information to improve medical practice and help patients manage medical conditions more effectively. The goal of care management is to improve patient health status and reduce the need for expensive medical services. The principal challenge is finding effective ways to change physician and patient behavior.”
Care Manager, Disease Manager, and Case Manager

The term care manager describes a role involved in disease management or case management. In some cases, one person may fill both roles, hence the more general role of care manager can be used to describe someone acting in either role or both roles. Care managers coordinate care and may provide nursing functions according to their credentials, the patient’s needs, the established care guidelines, and business rules governing the situation. Disease managers are population-based disease specialists who work with, advise, coach and monitor patients in self-management of their disease. Case Managers are focused on the individual patient as generalists. Care managers may be nurses, but this is not always the case. It depends on what services they are employed to provide.

This storyboard specifically demonstrates the value of effective, timely sharing of care plan information and other related clinical information with payer stakeholders to improve medication adherence, avoid adverse medication interactions, support the patient in making informed care decisions (that minimize financial impacts), and increase the patient’s understanding of and ability to self-manage a chronic condition. This improves communication by all stakeholders involved in the care and monitoring of the patient, and illustrates the importance of the patient being a well-informed member of the care team. The storyboard expresses a forward looking view of what could be possible with greater use of clinical information exchange to support effective care coordination from a payer perspective.

Terms to describe data sharing

This Care Plan DAM is implementation agnostic. Terms used with this storyboard to describe data exchange are purposely general. The term “share” does not imply a specific implementation technology. The expression, “care plan information is made available to be shared”, indicates no particular data sharing paradigm. The sharing could be achieved through any number of technical implementations. Information exchange could be achieved via a health information exchange (HIE) using a federated registry model or a centralized data repository model. It could be achieved using direct point-to-point mechanisms, or other application interface (API) mechanisms that exchange information through shared data resources. The diagram in Figure 1 is used in Figure 2 to indicate that no specific data sharing technology is implied when the exchange of information is depicted in the diagram.

Figure 1: Representation of “implementation agnostic” data exchange.

5.3.7.2 Introduction

The purpose of this storyboard is to illustrate the evolution of care plan information as it is shared between payers and providers. It illustrates the reconciliation and consolidation of care plan information as it is exchanged across disparate systems and used in human care planning tasks performed by payers and providers. It shows how care plan information contributed by a payer’s disease manager or case manager, integrates with other care plan information for the patient.

The storyboard describes care plan information generated by the disease management and case management workflows of a payer for a moderately complex patient’s care. It shows a flow of care plan information between a health plan care manager and the care providers involved in the management of a
patient with several health concerns. It shows information contributed by the patient being included in the plan. It illustrates how payer disease management and case management activities promote self-care activities, help address barriers to care, and improve care coordination.

This patient in the storyboard has multiple conditions and is involved in multiple care encounters. This health issue thread consists of seven (7) encounters with care providers and health plan care managers. Compared to other storyboards, it may seem large, but this storyboard represents what in reality could be a much larger set of interactions. Even in moderately complex care scenarios, one patient could experience many more encounters and receive services from many additional providers such as nutritionists, physical therapists, social workers, home health workers, and community-based service providers such as Meals on Wheels and transportation services.

This storyboard consists of the following patient encounters:

A. Primary Care Provider Encounter
B. Emergency Department (ED) Visit, Asthma
C. Health Plan Care Manager Encounter – Disease Management
D. Episode of Care, ED Visit to Hospital Admission
E. Primary Care Provider Follow-up Visit
F. ED Visit, Accident
G. Health Plan Care Manager Encounter – Case Management

Care plan and other clinical information is shared between systems to support the flow of care depicted in this story board.

Figure 2: Diagram of care plan “information sharing” illustrated in this storyboard

The information sharing infrastructures may include mechanisms which may support a variety of functional capabilities such as:
- federated document registry
- centralized document registry/repository,
- dynamic care plan management.
5.3.7.2.1 Storyboard Actors and Roles

- Patient: Adam Everyman
- Primary Care Provider: Dr. Patricia Primary
- Primary Care Management Nurse: Betty Provider, RN
- ED Clinicians: Unnamed actors at multiple Emergency Departments
- Hospital Physician: Dr. Aaron Attend
- Discharge Planning Nurse: An unnamed actor
- Health Plan Care Manager: Pamela Care-Manager, RN, CCM
- Health Plan Disease Management Nurse: also Pamela Care-Manager, RN, CCM
- Health Plan Case Management Nurse: also Pamela Care-Manager, RN, CCM

5.3.7.2.1.1 ENCLOSE A: PRIMARY CARE PROVIDER ENCLOUSE

5.3.7.2.1.1.1 PRE-CONDITION

Mr. Adam Everyman is a 52 year-old single man with asthma and is pre-diabetic. He is overweight, at risk of cardiovascular disease, suffers from depression and is a heavy smoker and occasional drinker.

Adam Everyman resides in Southern state and is employed at Work Is Fun, Inc. His insurance carrier is HC Payor, Inc. in a Midwest state. Adam’s health plan is sponsored by Work Is Fun and includes disease management and case management services that aid in the coordination of patient care. As a result of being diagnosed with asthma and depression, Adam was offered enrollment in his health plan’s disease management program. He accepted as a way to help him deal with his health conditions. Pamela Care-Manager, a Disease Manager Nurse at HC Payor, makes sure Adam is benefitting from services provided for patients diagnosed with chronic conditions such as asthma and depression. Pamela calls Adam every two weeks to see what she can do to help coordinate the care he receives and his own self-management of his conditions.

Dr. Patricia Primary is Adam’s primary care physician. As part of the physician’s routine practice before an annual physical, a panel of basic and diabetes screening lab tests is ordered for completion prior to the annual visit. Adam gets the testing as requested and the results are available for sharing with Dr. Primary. Prior to Adam’s appointment Dr. Primary reviews the lab test results so that she can quickly see that Adam’s fasting BSL was 8, the post prandial BSL was 11, and his HgbA1C was 7.1.

5.3.7.2.1.1.2 DESCRIPTION OF EVALUATION AND MANAGEMENT

Adam Everyman arrives for his annual check-up with Dr. Patricia Primary. He completes an Asthma control questionnaire in the waiting room before his appointment begins.

Dr. Primary performs a history and physical examination. Mr. Everyman tells Dr. Primary that he recently received information that his position will be eliminated and is uncertain of his future employment. As a result, his depression has worsened. Dr. Primary performs depression screening and an assessment for depression severity. Both the screening and the severity assessment indicate moderately-severe depression and the substance abuse screen indicates occasional binge drinking periods. Dr. Primary
discusses the nature of depression with Adam and asks him which symptoms are bother him most. They use this information to set a goal for addressing this concern. Dr. Primary discusses the risk of self-harm and the best management strategies. She explains the benefits of counseling, behavioral therapy, and medications. In the best interest of his health, Adam agrees to start on an antidepressant. Dr. Primary also makes a referral to behavioral health services so Adam can begin attending therapy sessions. She orders bupropion for his depression which also will help decrease his cravings to smoke. Adam is cautioned against alcohol consumption while he is taking bupropion. Dr. Primary orders a fasting blood cholesterol and triglyceride profile test and instructs Adam to get the tests before starting the bupropion. She explains that the test results will provide a pre-medication base-line that will help her track the effects of the bupropion on these other aspects of his health. She adds the medication treatment, referral to counseling, order for testing, and precautionary advice to his care plan.

Because Adam Everyman also smokes and previously planned to quit, Dr. Primary recommends participation in a local evening smoking cessation program. Adam agrees to give it a try. Dr. Primary adds this intervention to his care plan.

Adam has occasionally used albuterol to control flair-ups of his asthma in the past year. Given that infrequent side effects of albuterol include diabetes and depression, Dr. Primary recommends an alternative asthma control treatment and replaces the albuterol with ipratropium bromide inhalation. Adam’s asthma control test (the questionnaire completed by Adam at the start of his visit) confirms his prior asthma control has been less than effective. She advised Adam on proper and effective use of ipratropium inhalation. She explains the reason for replacing the albuterol treatment. Dr. Primary reviews Adam’s asthma management plan with him and adds the medication updates.

Adam’s pre-visit blood sugar and glycated hemoglobin levels (BSL and HgbA1C test results), confirm a diagnosis of diabetes. Adam’s test results meet the prescribing guidelines for oral medication. Dr. Primary explores with Adam various Type 2 diabetes management options. With Adam’s agreement, Dr. Primary prescribes an oral hypoglycemic and refers him to a nutritionist to discuss and develop a suitable diabetic diet regime. Dr. Primary explains the bupropion depression treatment might adversely affect his diabetes. She asks him to monitor his BSL closely and report a noticeable increase in his scores. She also refers Adam to see a diabetes educator to provide him with education about in-home glucose monitoring, medication management, and foot care. She adds these self-management activities to his care plan. Dr. Primary suggests physical exercise and a balanced diet for weight management, and also makes that notation in the care plan.

Mr. Everyman is asked to make a follow-up visit in one month.

5.3.7.2.1.1.3 POST-CONDITION
Adam’s new care plan information entered by Dr. Primary in the EHR system is made available to be shared. It includes the updated health concern associated with diabetes showing that Adam is no longer at risk for this disease but has now been diagnosed as having diabetes.

Adam Everyman gets the ordered lab tests then fills his prescription for bupropion. Mr. Everyman fills his ipratropium prescription and is given a demonstration by the community pharmacist on how to use the medication properly with a spacer. He attends the smoking cessation program.

These care services trigger claim activities from the primary care provider, pharmacy, and behavioral health service providers to Adam’s health plan.
5.3.7.2.1.2 ENCOUNTER B: ED VISIT, ASTHMA

5.3.7.2.1.2.1 PRE-CONDITION
One evening, Adam has an asthma attack that doesn't respond to repeated use of his ipratropium inhaler. He makes a trip to the emergency department (ED) at his local hospital.

5.3.7.2.1.2.2 DESCRIPTION OF ED VISIT
In the ED, the Adam’s condition is stabilized with treatments of a nebulized bronchodilator. The ED physician makes a detailed clinical assessment of Adam’s condition. The ED presentation is determined to be the result of the patient’s non-adherence to use of the prescribed ipratropium therapy. The ED physician refers Adam for immediate follow up with Dr. Primary. In the discharge summary, the ED physician documents Adam’s uncontrolled intermittent asthma, the treatment provided to stabilize his condition, and the referral to Dr. Primary for follow-up.

5.3.7.2.1.2.3 POST-CONDITION
The discharge summary information entered by the ED physician in the EHR system is available to be shared.

Triggered by the ED visit encounter diagnosis in the discharge summary indicating Adam’s uncontrolled intermittent asthma, the disease screening program of the HC Payor’s population health management system identifies Adam as needing disease management support.

5.3.7.2.1.3 ENCOUNTER C: HEALTH PLAN CARE MANAGER ENCOUNTER – DISEASE MANAGEMENT

5.3.7.2.1.3.1 PRE-CONDITION
The sharing of the ED discharge summary information triggers the disease screening program of the payer’s population health management system. The application uses the principle diagnosis of the encounter to determine that Adam is a candidate for an immediate asthma disease management encounter. The prior antidepressant prescription claim also had triggered a behavioral health flag to be set on Adam’s record in the HC Payor system.

5.3.7.2.1.3.2 DESCRIPTION OF HEALTH PLAN DISEASE MANAGEMENT NURSE CARE MANAGER ENCOUNTER

Pamela Care-Manager, RN, a nurse care manager plan for HC Payor, is responsible for providing regular asthma disease management calls to health plan members like Adam who have signed up for the disease management program. She sees the disease management screening report listing Mr. Everyman as a member needing an immediate asthma care management call. She reviews the clinical information and non-compliance assessment from his recent ED visit.

Pamela has a telephone discussion with Adam Everyman. She first confirms that Mr. Everyman consents to this information being recorded and shared with his primary care provider. She then confirms his contact information (work/mobile phone, email, title) and reviews the name of the Asthma disease management program in which he is enrolled with HC Payor. Sharing this information helps ensure that
Adam has accurate information on how to reach his health plan disease managers for any questions he may have about the services available to address his asthma.

She confirms Adam has scheduled his follow-up appointment with Dr. Primary. She explains that his health plan’s asthma disease management program includes interventions such as monitoring the frequencies and timing of flare-ups, and offers the use of a peak flow meter to help patients establish a baseline “personal best” to improve the way they monitor and document the severity of their asthma attacks. She explains that Adam should be contacting his PCP if his peak expiratory flow (PEF) reading drops below 80% of his personal best.

She asks Adam if he understands how to use a peak flow meter, what the readings mean, and what actions he needs to take based on the readings. Adam says he had used one in the past, and has received updated education on its use, but explains that he no longer has his PEF device. Pamela notes use of a PEF device is included in the asthma disease management protocol offered by HC Payer and is included in the health plan established by Adam’s employer, so she places an order for the PEF device from Adam’s mail-order pharmacy.

Responding to the additional behavioral health flag, Pamela asks Adam if he has interest in pursuing the behavioral therapy services referred by his PCP. Adam says he was intending to go, but didn’t know how to find therapy sessions that would be right for him. Pamela explains that his health plan includes support group therapy services offered at a behavioral health center in his community and explains that they talk about a wide range of topics from work-life stress, to substance abuse, to coping with chronic illness. Based on the clinical information on his work stress, history of alcohol abuse, current medications (bupropion) and the physician referral for counselling, Pamela is able help Adam find a behavioral health therapy that he felt comfortable attending and was provided at a local health center. She provides Adam with the address, phone number, and the meeting schedule.

Pamela can see that Adam was recently diagnosed with diabetes. She also can see his latest HgbA1C test result from his recent lab tests. Pamela sees the notation made by his PCP recommending exercise and a balanced diet. She asks about his diet. She reiterates to Mr. Everyman that the care plan established with his PCP includes a recommendation for exercise and a balanced diet for weight stabilization. She informs Adam that gym membership is a wellness benefit of his health plan and that his local community center offers programs for walking groups, dance groups, and healthy eating. Adam thanks her for the information. He assures her that he intends to lose weight and exercise more, but explains that his car is not working and he does not have transportation to take advantage of these programs, and with the threat of losing his job he can’t commit to spending any additional money.

During the call with Adam, Pamela updates the payers’ DM care plans for Mr. Everyman to reflect his interest in specific interventions, his goals, and the barriers identified in her conversation with Adam. She documents that Adam’s health plan services include a gym wellness benefit but that Adam is not interested due to transportation challenges. She also notes that he does not currently have a PEF device and that his plan would cover supplying one. Pamela updates the care plan information in her system for Mr. Everyman. She adds a new goal to obtain and record a baseline peak flow reading when not wheezing and patient self-monitoring when wheezing starts. She explains to Adam that once he begins using the peak flow meter and recording the readings, the record of peak flow readings and asthma exacerbation will be available to share with his PCP. And that this is something they discuss when she calls.
At the end of the call Pamela reviews with Adam the payer recommended care plan adjustments based on his employer-sponsored disease management program for each of his conditions.

She also asks if Adam still has the annual exam one-month follow-up visit with his PCP in his calendar. Noting that the two visit are within days of each other, Pamela suggests that Adam ask his physician if the previously scheduled follow-up appointment could be combined with his ED visit follow-up appointment, since both may not be required.

She confirms that on the next follow-up call with Adam she will make sure he received the inhaler and educational materials and they will discuss his baseline reading and review how the peak flow readings he has gathered compare to his “personal best”.

5.3.7.2.1.3.3 POST-CONDITION

The updated payer disease management care plan information is made available to be shared.

The update of the payer disease management care plan information triggers a notification mechanism within Dr. Primary’s EHR. Dr. Primary reviews the updated payer disease management care plan information and sees the order for the PEF device that was covered by Adam’s insurance. Within the EHR she reviews Adam’s asthma medications and sees that he needs a refill for his inhaler. She updates the prescription and an order is sent electronically to Adam’s mail-order pharmacy. The peak flow meter is delivered at no cost to the patient along with the refill for his asthma inhaler and a CD that describes how to use them.

Pamela makes periodic outreach calls to Adam at home to check on his wellbeing, his adherence to his care plan, and to learn of any new problems or barriers to care that may arise. During their calls, Pamela documents Adam’s peak flow meter reading data and helps him to monitor his PEF scores to make sure they do not drop below 80% of his personal best.

5.3.7.2.1.4 ENCOUNTER D: ED VISIT AND HOSPITAL ADMISSION EPISODE OF CARE

5.3.7.2.1.4.1 PRECONDITION

Adam Everyman is out-of-town on a trip in a Northern state and experiences an asthma attack. He is admitted for treatment at the Emergency Department at the local hospital. The ED physician notes an elevated temperature of 99.5 and a cough. She reviews the patient’s chest x-ray, oxygen saturation readings from pulse oximeter monitoring, and auscultates his lungs. She decides to admit him to the hospital for treatment of pneumonia. The patient’s insurance authorizes up to three days of inpatient care for this condition.
5.3.7.2.1.4.2 DESCRIPTION OF HOSPITAL TREATMENT AND DISCHARGE
While being treated in the Emergency Department of the Northern Hospital, blood microbiology results confirm that Adam has pneumococcal pneumonia. Treatment with IV antibiotics is initiated and Adam is admitted for inpatient care. The ED visit and inpatient admission information is captured in the hospital’s EHR system. He remains in the hospital for more than two days. A formal multi-disciplinary hospital care plan is created.

Dr. Aaron Attend prescribes acetaminophen for Adam’s discomfort, in combination with the NSAID naproxen sodium for pleuritic pain management, explaining that the pleuritic chest pain will taper within a few days. In creating the multi-disciplinary care plan, Adam’s pre-hospital medications and treatments are reconciled with current inpatient medications and treatments, and reflected in the hospital’s care plan. The notes captured during Adam’s encounter are documented in Northern Hospital’s EHR system.

On day three Adam is well enough to go home. The discharge planning nurse notes his post-hospitalization self-care during his travel and once at home. She provided him with hard copy handouts describing his self-care. The materials describe signs and symptoms that would indicate a need to contact his primary care doctor immediately. Because of the patient’s history of binge drinking Dr. Aaron Attend cautions Mr. Everyman to avoid drinking any alcoholic beverages while taking this pain and antidepressant medications.

In addition to writing a discharge note, Dr. Attend updates the Adam’s care plan in his EHR to include the post-pneumonia treatment goal for restored asthma control.

Dr. Attend sends an oral antibiotic prescription to the hospital pharmacy so Adam can pick up the medication on his way out of the facility. Dr. Attend reviews the discharge instructions with Adam. He includes a recommendation for Adam to follow-up with his primary physician within 5 days of discharge to check his lungs. The discharge care plan also includes a recommendation for Adam to receive a pneumococcal vaccination.

A copy of the discharge summary and care plan information is provided to Mr. Everyman.

5.3.7.2.1.4.3 POST-CONDITION
The discharge summary and care plan information is available to be shared.

Claim activity from Northern Hospital triggers the HC Payor, Inc. system to gather the updated clinical information.

During their regular phone check-ups, Pamela Care-Manager confirms that Adam has scheduled his follow-up visit with his Dr. Primary.

5.3.7.2.1.5 ENCOUNTER E: PRIMARY CARE PROVIDER FOLLOW-UP VISIT

5.3.7.2.1.5.1 PRECONDITION
Adam’s follow-up visit triggers the PCP’s EHR to gather pertinent information.

Dr. Primary reviews the care planning information shared by HC Payor as well as the recent discharge and care planning information from Adam’s ED visits and hospitalization. This includes access to diagnostic images and reports generated during those episodes of care.
5.3.7.2.1.5.2 DESCRIPTION OF PRIMARY CARE PROVIDER EVALUATION

Mr. Everyman arrives at Dr. Patricia Primary’s office five days after being discharged from Northern Hospital. He is recovering from his bout with pneumonia.

Dr. Primary confirms that Adam has been following his discharge plan. She notes Adam’s continued use of acetaminophen for discomfort related to the pneumonia and gives a verbal warning of the liver danger associated with acetaminophen overuse. She performs a brief physical exam to assess Adam’s lung function and notes the improvement in his condition. In addition, she updates the records in her EHR to include the new antibiotic medication that Adam was prescribed by Dr. Attending which Adam confirmed he is taking.

5.3.7.2.1.5.3 POST-CONDITION

The care plan information in the system used by Adam’s PCP is up-to-date. The clinical notes and medication list reflect Adam’s current situation. Adam’s current care plan information, including references to the recent discharge summaries, is available to be shared.

5.3.7.2.1.6 ENCOUNTER F: ED VISIT, ACCIDENT

5.3.7.2.1.6.1 PRECONDITION

Pamela Care-Manager’s system has been monitoring Mr. Everyman’s claim activity and care plan updates. As new data updates become available, Adam’s profile in the HC Payor system is updated. At their scheduled calls, Pamela talks to Adam about how he is doing and they review care plan recommendations made by Dr. Primary. During their calls, Pamela notes that Adam continues to feel he is self-sufficient and does not need a home nursing evaluation.

One night Adam has another visit to the ED because of a car accident which results in head trauma and a broken arm.

5.3.7.2.1.6.2 DESCRIPTION OF ED VISIT

Though Adam can walk and is conscious when he arrives at the ED, he has a broken arm on his writing hand and his facial contusions clearly are indicative of head trauma. X-rays are ordered and performed to confirm the broken arm. A temporary cast is applied and arrangements are made for referral to an orthopedic specialist.

Given the possibility of mild Traumatic Brain Injury (TBI), a CT of head and neck also is done. The CT confirms Adam has no intracranial bleeding. However, the ED’s Concussion Protocol for physical and cognitive testing determines that Adam has a headache that is uncharacteristic for him and short term memory loss on the details of the car accident. The headache is not provoked or aggravated by neck movements. Head and neck examination (including flexion-rotation test, cranio-cervical flexion test, length-tension test) and the CT show no signs of cervical spine injury.

The ED physician documents Adam’s signs and symptoms of concussion in the ED’s EHR system and his broken right arm. She treats the pain for his headache and broken arm conservatively with
acetaminophen with codeine. She provides him with hard copy handouts about concussion symptoms that would indicate a need to contact his primary care doctor immediately. The ED discharge plan includes the referral to see an orthopedic specialist for treatment of his forearm fracture. It also recommends that Mr. Everyman schedule an appointment with Dr. Primary within the next couple of days.

5.3.7.2.1.6.3 POST-CONDITION

The EHR system of the ED creates a discharge summary to summarize the ED visit and discharge instructions. The discharge summary information is available to be shared.

5.3.7.2.1.7 ENCOUNTER G: HEALTH PLAN CARE MANAGER ENCOUNTER – CASE MANAGEMENT

5.3.7.2.1.7.1 PRECONDITION

Pamela Care-Manager’s system has been monitoring Mr. Everyman’s claim activity and the availability of additional clinical and care plan information. As Pamela Care-Manager receives new data, updates are made to keep Mr. Everyman’s profile current in the HC Payor system.

5.3.7.2.1.7.2 DESCRIPTION OF HEALTH PLAN CARE MANAGEMENT EVALUATION

Pamela Care-Manager reviews the new activity from Adam’s most recent ED visit. She sees the medication update for the headache and broken arm. She sees the referral to the orthopedic specialist. She upgrades her scheduled call to a priority call for this day’s member calls. She sets a call agenda to review Adam’s concussion symptoms, to discuss the impact of the broken arm on his activities of daily living, make certain he was able to get an appointment scheduled with the orthopedic specialist, and confirm the status of his appointment with his PCP. She also notes to review his health plan coverage for the orthopedic specialist visit and to make sure Adam has adequate transportation to help him get to these appointments.

During the call, Adam indicates he has read the concussion symptoms handout from the ED discharge material and that the headache has gradually resolved, and there are no new symptoms.

Regarding his broken arm, Adam notes he has limited mobility in his right hand which is causing several challenges. They discuss his pain management. It is noted in the ED discharge summary that Adam should minimize the use of pain medication. However, Pamela confirms that Adam is experiencing severe pain and is not getting relief from the recommended dosage. He is overwhelmed with his situation and couldn’t recall if the appointment with the orthopedic specialist was confirmed. He is also concerned about missing so much work and asks if it would be ok to push out a follow-up visit with his PCP until after his broken arm is more resolved.

Based on the type of needs that Adam is describing, Pamela determines that he would benefit from additional care coordination. While talking with Adam about everything that he is experiencing, she recommends enrolling him in HC Payor’s case management program where he will receive additional
support services. Adam agrees to be enrolled as he is overwhelmed with his current care issues. Pamela begins a case management plan for Adam and notes his current frame of mind. She notes the challenges he mentioned of the broken arm on his ability to perform his duties at work and around the house, his pain management issues, and his concerns about being able to make it to so many different doctor appointments. Pamela begins functioning in the combined role of both a case manager and a disease manager for Adam.

Given the complexity of Mr. Everyman’s overall situation, and in her CM/DM role, Pamela recommends a care team meeting with Adam’s PCP and staff to make sure there are not duplications, gaps or contraindications in Adam’s care plan. Her documentation in the HC Payor system includes the request for a formal care team meeting. The system automatically sends a notification to Dr. Patricia Primary to facilitate scheduling Adam’s care team meeting. Pamela sets a planning phone conference with Dr. Primary’s Case-Manager Betty Provider, for the day before Adam’s the scheduled care team meeting to review Adam’s care plan, review his health plan orthopedic specialist and physical therapy coverage and confirm that they are on the same page regarding recommendations. Together they set the care team meeting agenda to make sure all of Adam’s health concerns, goals, and barriers to care are addressed.

5.3.7.2.1.7.3 POST-CONDITION
As the care team works together to support Adam and his care, updates in each EHR are made available for sharing with other EHRs. Conference calls are used to facilitate care team discussion and the care team meets with Adam on a scheduled basis. Adam’s care plan information includes payer interventions, provider interventions, hospitalization and ED visits discharge summaries, test results, etc. and this information is shared with Adam’s entire care team. Specific activities associated with each of Adam’s chronic diseases is recorded and tracked in his care plan. Other activities associated with managing his specific complex case are also recorded and tracked in his care plan. Enabled by a more comprehensive and organized view of Adam’s care plan information, Dr. Primary and Pamela Care-Manager make sure that Adam gets the care he needs to ensure optimal outcomes.

Once the care team and Adam agree that his complex health situation is under better control, Pamela will discharge Adam from HC Payor’s complex care management program. Adam will remain enrolled in the disease management program to continue supporting him with the management of his chronic conditions.