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# HL7 Version 3 Standard: Service Oriented Architecture Care Coordination Service, Release 1
10 May 2014

## HL7 DSTU Ballot

**Sponsored by:**
**Patient Care Work Group**
**Service Oriented Architecture Work Group**

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**Additional Interested Work Group Name:**
**Clinical Decision Support Workgroup**

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## Note to Readers

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This document describes the Service Functional Model (SFM) for the HL7 Coordination of Care Services Specification, which is specified under the Service Development Framework process under the auspices of the Healthcare Services Specification Project (HSSP). Further context is given in the overview section below, but one key point to note is that the SFM provides a Service **Interface** specification, NOT the

40   specification of a technical Service platform specific implementation. This is a critical distinction in terms of Service Oriented Architecture. There could be different ways of implementing all or part of the functionality to support the behavior described in this specification.

## Change History

| Version | Date | Author | Changes |
|---------|------|--------|---------|
| 0.5 | March 17th, 2013 | Jon Farmer, Enrique Meneses | Draft for comments and community feedback – HL7 May 2013 ballot cycle |
| 1.0 | March 23rd, 2014 | Enrique Meneses Stephen Chu MD PhD Laura Heerman Langford PhD RN | Many updates based on ballot comments, community feedback and workgroup meetings. DSTU – Draft Standard for Trial Use – HL7 May 2014 ballot cycle |

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## Project Sponsors

65   HL7 Patient Care Work Group - http://wiki.hl7.org/index.php?title=Patient_Care

HL7 Care Plan Project      - http://wiki.hl7.org/index.php?title=Care_Plan_Project

HL7 Service Oriented Architecture Work Group - http://hssp.wikispaces.com

# TABLE OF CONTENTS

# PREFACE

The Service Specification Development Framework Methodology is the methodology followed
to define HSSP specifications. The methodology sets out an overall process and defines the
115    responsibilities of the Service Functional Model (SFM). Section 2 sets out the business context
for this particular specification, but first it is important to understand the overall context within
which this specification is written, i.e. its purpose from a methodology standpoint.

## HL7-OMG Healthcare Services Specification Project (HSSP)

The Healthcare Services Specification Project (HSSP) [http://hssp.wikispaces.com] is a joint endeavor
120    between Health Level Seven (HL7) [http://www.hl7.org] and the Object Management Group (OMG)
[http://www.omg.org].  The HSSP was chartered at the January 2005 HL7 meeting under the Electronic
Health Records Technical Committee, and the project was subsequently validated by the Board of
Directors of both organizations.

The HSSP has several objectives.  These objectives include the following:

125    • To stimulate the adoption and use of standardized "plug-and-play" services by healthcare
         software product vendors
       • To facilitate the development of a set of implementable interface standards supporting agreed-
         upon services specifications to form the basis for provider purchasing and procurement decisions.
       • To complement and not conflict with existing HL7 work products and activities, leveraging content
130      and lessons learned from elsewhere within the organization.

Within the process, HL7 has primary responsibility for:

       • Identifying and prioritizing services as candidates for standardization
       • Specifying the functional requirements and conformance criteria for these services in the
135      form of Service Functional Model (SFM) specifications such as this document
       • Adopting these SFMs as balloted HL7 standards.


These activities are coordinated by the HL7 Services Oriented Architecture SIG in collaboration with other
HL7 committees. For this DSTU, the Coordination of Care Service Specification Project is sponsored by
140    the HL7 Patient Care Working Group in close collaboration with the Care Plan project which is leading in
the specification of the clinical domain models [http://wiki.hl7.org/index.php?title=Care_Plan_Project].

Based on the HL7 SFMs, OMG will develop "Requests for Proposals" (RFPs) that are the basis of the
OMG standardization process.  This process allows vendors and other submitters to propose solutions
that satisfy the mandatory and optional requirements expressed in the RFP while leaving design flexibility
145    to the submitters and implementation flexibility to the users of the standard.  The result of this
collaboration is an RFP Submission, which will be referred to in the HSSP process as a Service Technical
Model (STM). HL7 members, content, and concerns are integral to this process, and will be explicitly
included in the RFP creation and evaluation process.

It is important to note that the HL7 SFMs specify the *functional* requirements of a service, the OMG RFPs
150    specify the *technical* requirements of a service, and the STM represents the resulting technical model,
except as specified below. In many cases, SFMs describe an overall coherent set of functional
capabilities and / or define a minimum set of behaviors necessary to guarantee a minimal level of service
in a deployment scenario. These capabilities may be specialized or subdivided from both functional and

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informational (semantic) perspectives to provide conformance "profiles" that may be used as the basis for
155 the OMG RFP process and/or implemented.

## Service Definition Principles

The high level principles regarding service definition that have been adopted by the Services
Specification Project are as follows:

- Service Specifications shall be well defined and clearly scoped and with well understood
160 requirements and responsibilities.

- Services should have a unity of purpose (e.g., fulfilling one domain or area) but services
themselves may be composable.

- Services will be specified sufficiently to address functional, semantic, and structural
interoperability.

165 - It must be possible to replace one conformant service implementation with another meeting the
same service specification while maintaining functionality of the system.

A Service at the SFM level is regarded as a system component; the meaning of the term "(system)
component" in this context is consistent with UML usage[1]. A component is a modular unit with well-
defined interfaces that is replaceable within its environment. A component can always be considered an
170 autonomous unit within a system or subsystem. It has one or more provided and/or required interfaces,
and its internals are hidden and inaccessible other than as provided by its interfaces.

Each Service's Functional Model defines the interfaces that the service exposes to its environment, and
the service's dependencies on services provided by other components in its environment. Dependencies
in the Functional Model relate to services that have or may in future have a Functional Model at a similar
175 level; detail dependencies on low-level utility services should not be included, as that level of design is not
in scope for the Functional Model.

The manner in which services and interfaces are deployed, discovered, and so forth is outside the scope
of the Functional Model. However, HSSP Functional Models may reference content from other areas of
HSSP work that deals with architecture, deployment, naming and so forth. Except where explicitly
180 specified, these references are to be considered informative only. All other interactions within the scope
of the scenarios identified above are in the scope of the Functional Model.

Reference may be made to other specifications for interface descriptions, for example where an interface
is governed by an existing standard.

## Overall disclaimers

185 - Examples are illustrative and not normative unless otherwise specified

- The scope of information content of HSSP service specifications is not limited to HL7 content models.
At a minimum, however, specifications should provide a semantic profile as part of its conformance
profile to provide support for HL7 content models where applicable.

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[1] It is expected that services will be defined, in response to the OMG RFP process, as UML components;
however that level of design is outside the scope of the Functional Model.

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## Readers Guide

190     Based upon the nature of your interest, we suggest the following as areas to focus your attention:

| Audience | Sections (In order of priority) |
|---|---|
| Domain Committees, SME's | 1, 2, 3, 4 |
| Architects, HSSP | 1, 3, 4 |
| RFP Submitters | 1, 5, 4, 3 |

# 1. EXECUTIVE SUMMARY

## Background[1]

The World Health Organization (WHO) defines chronic diseases as "diseases that are of long duration and generally slow progression (http://www.who.int/topics/chronic_diseases/en/)" and can have long-term effects. "Chronic" is usually applied to diseases lasting over 3 months (World Health Organization). Individuals of all ages are living longer with chronic illness and disability. The World Health Organization[2] 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 over time and episodes of acute illness are superimposed, the number of care providers contributing to individual care increases as well. 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 and 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[3]. 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.

The ability to target appropriate services and to coordinate care over time, across multiple clinicians and sites of service, with the engagement of the individual (i.e. longitudinal coordination of care) is essential to alleviating fragmented, duplicative and costly care for these medically complex and/or functionally impaired persons.

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.

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

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[1] Laura Heermann Langford RN PhD, Stephen Chu MD PhD. "HL7 Care Plan Domain Information Model September 2013 Informative Ballot." http://wiki.hl7.org/index.php?title=Care_Plan_Project

[2] World Health Organization, http://www.who.int/features/factfiles/noncommunicable_diseases/en/index.html

[3] Coleman, MD. MPH, Eric A. "Preparing Patients and Caregivers to Participate in Care Delivered Across Settings: The Care Transitions Intervention." *Journal of the American Geriatric Society* 52, (2004): 1817-1825.

[4] Institute of Medicine. "Crossing the Quality Chasm: A New Health System for the 21st Century." http://www.edu/~/media/Files/Report%20Files/2001/Crssing-theQuality-Chasm/Quality%20Chasm%202001%20%20report%20brief.pdf

230 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 in the longitudinal care space, care team members need more information than standard chart summaries typically provide. Care team members,
235 including patients, benefit from sharing comprehensive patient data and information, including the care plan. In addition, the contributions of the care team to this information needs to be current for all stakeholders as it changes in order to avoid communication gaps and conflicting interventions.

240 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,
245 needs, and preferences are respected in health care decision making[4].

The identification and harmonization of standards for the longitudinal coordination of care will improve efficiencies and promote collaboration by:

250 • 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
255 • Reducing paper and fax, and corresponding manual processes during care coordination
• Supporting the timely transition 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
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# PROJECT OVERVIEW

The scope of this specification is to define the functions or capabilities required for effective coordination of care systems. It includes illustrative story boards and care team collaboration illustrative models. This service functional model (SFM) will define the scope of the requirements for a subsequent phase of the project which will define a technical services specification.  The service capabilities define the functions and may not map to a technical service operation with a 1-to-1 relationship.

Development of the *HL7 Coordination of Care SFM* is guided by the following principles:

- Ongoing coordination of care is a collaborative activity between *care team* members
- The patient and designated family care givers are members of the *Care Team*
- Effective coordination of care requires a systems engineering perspective which considers all the parts of the (eco)system:
  - Care Team collaboration
  - Goal oriented care planning
  - Tracking care activities and interventions
  - Continual Assessment and Review
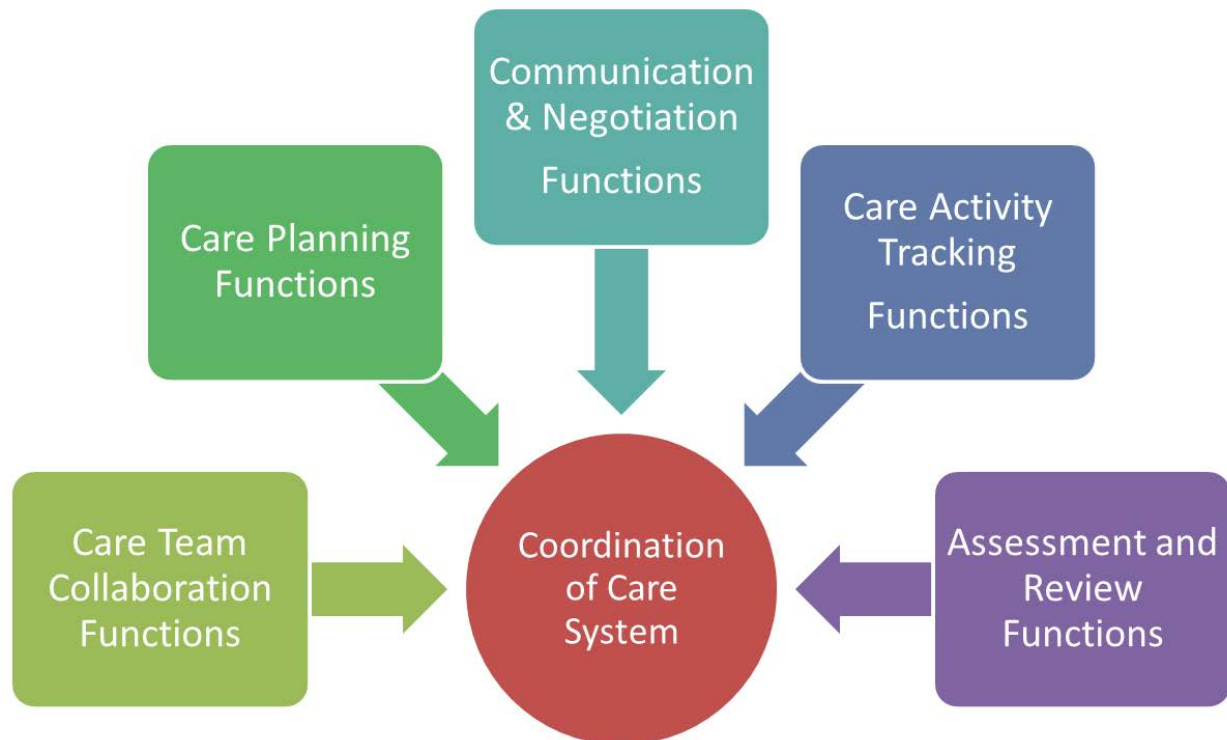  - Clinical domain/specialty and care setting context



**Figure 1 - Coordination of Care Service Functions**

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## Project Goals

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- Identify domain functions or capabilities to support dynamic, evolving and ongoing clinical care and the coordination of that care, with the following understanding about the identified capabilities:
  - The capabilities represent individual building blocks and do not express how they form the bigger story of care coordination.

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  - The capabilities support an emergent and dynamic process resulting from care team interactions
- Illustrate how the capabilities support dynamic coordination of care interactions
- Specify requirements necessary to support health care systems which incorporate dynamic and ongoing contributions of care team members in order to reduce gaps in

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  communication, such as:
  - Missing or late change updates
  - Incorporation of critical new information
  - Conflicting or redundant care strategies
- Support a connected care team with a shared perspective of a coordinated care plan

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## Assumptions

- Familiarity with the HL7 Care Plan Domain Analysis model and related HL7 Patient Care Workgroup artefacts.

305 ## Scope of Service Functional Model

- Identify Coordination of Care Service domain capabilities (Normative for DSTU)
  - The capabilities express domain level business functions
  - The capabilities do not describe a technical specification
  - The capabilities define the "what" but not the "how" of coordination of care

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- Illustrative clinical story boards.
- Illustrate a pattern for use of the capabilities (Non-Normative for DSTU)
  - The patterns define the elements of a process and how the individual capabilities (building block functions) fit with in an overall dynamic, changing and evolving process among care team members coordinating care across care settings.

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## Out of Scope for the Service Functional Model

- Definition of any new domain information models. The scope of the domain is based on work done by the HL7 Patient Care work group (specially the Care Plan Project).

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- Governance, organization policies and business rules
  - All mentions of individual professions and interactions are illustrative only. They are not meant to exclude a given group. Examples are not meant to favor or prescribe a specific approach to coordination of care.

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## Significant Terms

The following table summarizes significant terms required in order to understand the service functional model. For a complete presentation of these terms please refer to the PCWG Care Plan Domain Analysis Model.

### *Care Plan Domain Terms*

| Term/Concept | Description |
|---|---|
| **Plan** | The concept "plan" is used synonymously with "care plan" in its generic sense. Refer to Care Plan DAM for a description of "care plan". |
| **Health Concern** | A Health Concern is a health related matter that is of interest, importance or worry to someone, who may be the patient, patient's family or patient's health care provider. (http://wiki.hl7.org/index.php?title=Health_Concern)<br>Health concerns specify the condition oriented reasons for creating the plan |
| **Health Goal** | A desired outcome attached to patient health problems and plans (adapted from HL7 RIM Mood Code: Goal)<br>A Health Goal may be composed of finer grained intermediary milestones |
| **Health Risk** | A factor (including lifestyle, environmental, family or genetic in nature) or activity that may adversely affect the health or wellbeing of an individual.<br>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 |
| **Care Barrier** | 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. |
| **Patient Preference** | 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. Care preferences express patient desires of how they want to be treated or their choice(s) of intervention/care activity. |
| **Acceptance Review** | In the context of care plan, acceptance review is assessment/appraisal or evaluation of relevant care plan components/activities (e.g. health concern, health goal, health risk, intervention) with the intention of accepting or changing one or more of these components.<br>An AcceptanceReview captures the care team's (including patient) agreement with the health goals of the plan.<br><br>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 |

| Plan Review | The assessment/appraisal or evaluation of the overall care plan with the intention of changing or closing the care plan. |
| --- | --- |

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### Reconciliation[3]:

Reconciliation (as applied to health care information) is the process of merging and adjudicating conflicts between health care information obtained from multiple sources. The sources of information can be electronic and/or paper-based. The reconciliation process typically occurs
335 during transfers or transitions of care from one healthcare practice setting or level of care to another, and can occur at other times as needed. Some examples of the type of information that may be reconciled include: medical history (diagnosis, problems), medications, allergy/intolerance, care strategies and the patient's care plan. Other information of administrative, social services and financial nature such as payor and insurance coverage data
340 may also be included.

### Components of Reconciliation:

**Technical**: the process of procuring and merging clinical information from multiple sources. The technical component typically involves sending query requests to clinical information systems or
345 electronic health record repositories and merging the records returned from multiple repositories. The query parameters can be predetermined or defined at runtime by clinical users based on characteristics or profile of the patient. The technical reconciliation process also involves validation and highlighting of patient identification, electronic identification of duplicates, overlaps, conflicts and superseded information to facilitate clinical reconciliation.
350

**Clinical**: the process of adjudicating conflicts between clinical information obtained from multiple sources by clinicians. The adjudication may involve/include: resolving ambiguities, duplications, inconsistencies, contradictions, errors and omissions. Additional adjudication may need to occur in light of patient preferences, clinical status changes, current governance, or
355 national, state and organizational regulations and policies. This requires the comparison and evaluation of information obtained from multiple sources and validation with the patient and/or authorized patient representatives, prescribers and dispensers.
The clinician corrects, updates, and confirms the reconciled information; and highlight issues that need clinical attention.
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**Harmonization**: is the process of bringing into or coming to agreement, harmony or accord. It involves adjustment of differences in information, measurements, methods, schedules or specifications to make them uniform or mutually compatible. Harmonization is considered synonymous with reconciliation[4].

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[3] The definition for reconciliation and the components of reconciliation details are compiled from the following sources:
**IHE technical framework supplement on reconciliation** of diagnosis, allergies and medications
(http://www.ihe.net/Technical_Framework/upload/IHE_PCC_Suppl_Reconciliation_Rev1-1_TI_2011-09-09.pdf)
And **Department of Health Victoria (Australia) Quality Use of Medicine**:
"Medication reconciliation is a formal process of **obtaining** and **verifying** a complete and accurate list of each patient's current medicines. Matching the medicines the patient SHOULD be prescribed to those they are ACTUALLY prescribed. Where there are **discrepancies**, these are discussed with the prescriber and reasons for changes to therapy are documented. When care is transferred (e.g. between wards, hospitals or home), a current and accurate list of medicines, including reasons for change is provided to the person taking over the patient's care" (http://www.health.vic.gov.au/qum/med_reconciliation.htm)
**Society of Hospital Pharmacy Australia**:
"Medication reconciliation is conducted to avoid errors of transcription, omission and duplication of therapy …" (SHPA Standards of practice in clinical pharmacy, J Pharm Pract Res 2005; 35:122-146)

[4] http://thesaurus.com/browse/harmonize

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**Synchronization** (in computing):
The process of making two or more data stores, devices, programs or systems to have exactly the same information and behavior, or be coherent with each other at a given time.

## 2. BUSINESS STORY BOARDS

370     Care Plan Reconciliation/Harmonization:

May be applied to
- Health Concern/Problem
- Health Goal
375     - Health Risk
- Care Preference
- Care Barrier
- Activity/intervention

380     ## Storyboard 1

A 76-year old patient had total hip replacement. On Day 5 post-op the patient was discharged back to Aged Care facility for continuous long term care.Included in the hospital discharge document is an orthopaedic Plan of Care developed by the patient's orthopaedic surgeon Patient's attending Provider (PCP) has developed a post total hip replacement care plan for the

385     patient

The clinical information system (CIS) of the Aged Care facility initiated a Plan *synchronization* process that brought the contents of the orthopaedic Plan of Care into the Care Plan such that the synchronized Care Plan contains the information of both Plans.

390

The decision support application of CIS also initiated a *technical reconciliation* process which identified conflicts in the rehabilitationactivity orders between the Care Plan and orthopaedic Plan of Care:

395     Care Plan – standing orders include the following activities
- Attend daily physiotherapy session
- Transfer from bed to chair independently
- Weight bearing as tolerated
- Walk to bathroom and hallway using walking frame
400     Orthopaedic care plan –
Day 6
Continue exercises in bed (3-4 sessions each day): bed support knee-bents, buttock contractions, abduction exercises, quadriceps exercises, straight leg raising
Day 7
405     Standing exercises (3-4 sessions each day): standing knee raises, standing hip abduction, standing hip extension
From Day 8:
Transfer from bed to chair independently
Walking using walking frame
410     Gradual increase weight bearing as tolerated

The CIS highlighted the inconsistencies in the rehabilitation activity order between the two Plans and brought to the attention of the PCP

415    The PCP conducted a review of the two plans, initiated a ***review conversation*** with the patient's orthopaedic surgeon; and noted that the reasons for a slower rehabilitation schedule were due to the surgical (incision) approach, condition of the patient's hip joint, and mild neuromuscular weakness/problem

420    The PCP initiated a ***clinical reconciliation*** process and harmonized the care plan to adopt the rehabilitation schedule prescribed in the orthopaedic care plan

## Storyboard 2

425    A 70 year old Retirement home resident with a medical history of type 2 DM and hypertension was admitted to the hospital with sudden onset of right-sided weakness and right facial droop, dysarthria, and slight confusion. CT of the brain indicated a thrombus in a branch of the left internal carotid artery, with approximately 50% occlusion due to atherosclerosis. There was an area of infarction in the light anterior hemisphere. There was no evidence of a subarachnoid haemorrhage. Speech pathologist assessment placed the patient on aspiration alert. The

430    hospital dietitian/nutritionist recommended vitamised diet
The patient's hypertension/CVS and Diabetes care plan was sent by the patient's PCP. The care plan recorded counseling on dietary changes (including increased consumption of fresh fruit and vegetables, low-fat dairy products, omega-3 fatty acids; reduction of saturated fat intake, trans-fatty acids, and cholesterol; sodium restriction).

435

The hospital clinical information system (CIS) initiated a ***Plans synchronization*** process which synchronized relevant contents of the PCP care plan into the hospital Stroke care plan

The decision support application of CIS also initiated a ***technical reconciliation*** process which
440    identified conflicts between the nutrition components of the two Plans
The CIS highlighted the conflicts and brought them to the attention of the hospital dietitian.

The hospital dietitian initiated a clinical review of the contents of the plans. ***Clinical reconciliation*** conducted by the dietitian resulted in overriding the diet order in the PCP care
445    plan

## Storyboard 3

A female patient has medical history of rheumatoid arthritis diagnosed when she was 46 years of age. She was treated by her rheumatologist during episodes of acute exacerbation, but
450    otherwise her rheumatoid arthritis was managed by her Primary Care Provider (PCP).
The rheumatoid arthritis care plan developed by her PCP included the following medication treatment:
- Selective cox-2 inhibitor: celecoxib
- Corticosteroid
455    
- Disease modifying anti-rheumatic drugs: methotrexate
- Supplements: vitamin D and calcium

At age 52 the patient was diagnosed with Type 2 Diabetes Mellitus. The patient's blood lipid profile also confirmed hyperlipidaemia.
460    The patient's PCP initiated a Diabetes care plan after discussions with the patient.

The clinical information system (CIS) used by the PCP initiated a ***Plans synchronization*** process which synchronized the medication interventions of both the rheumatoid arthritis and diabetes care plans.

465

The decision support application of CIS also initiated a ***technical reconciliation*** process which assessed the health risks of anti-rheumatoid medication therapy to this patient.
The CIS highlighted the selective Cox-2 inhibitor as a cardiovascular risk factor for patient with diabetes and hyperlipidaemia

470

The PCP initiated a clinical review of the anti-rheumatoid medication therapy, initiated a **review conversation** with the patient's rheumatologist to discuss the anti-rheumatoid medication therapy and how best to mitigate the associated cardiovascular risks.

475    Following discussion with the rheumatologist, the PCP initiated a ***clinical reconciliation*** process and changed the selective Cox-2 inhibitor to acetaminophen/paracetamol and a weak opiate (codeine)

## Storyboard 4[5]

480    **Background**
A 78 year old female patient suffering from congestive heart failure and atrial fibrillation was discharged from hospital to a skilled nursing facility before blood test for drug (digoxin) level was available to the discharging physician. Her discharge medications included amiordarone and lanoxin.

485    A physician on-call at the skilled nursing facility was requested to add digoxin to the prescribed medication list at the insistence of the patient. A pharmacy technician was told not to question physician order when attempted to raise question on the new digoxin prescription on existing lanoxin prescription.
Three days after admission to the skilled nursing facility, the patient started to exhibit signs and
490    symptoms of unwell.
A week later, patient showed full features of digitalis toxicity. Blood test showed serum digoxin level double the already high drug level on specimen taken at discharge from hospital.

The physician attending the nursing home patients conducted a review of the care plan and
495    noted from the discharge plan that the patient was prescribed lanoxin and had pending serum digoxin test result.
The physician invoked the CCS communication function to find out from the discharging physician the result of the serum digoxin test.
The discharging physician responded via a message with the test result: serum digoxin level =
500    4.099 nmol/liter (3.2ng/L); [normal 1.2-2 nmol/L; 0.8-2ng/L]
The SNF physician explained to the patient that lanoxin is a brand named medication for the generic digoxin, and that her serum digoxin level was already too high.
The physician withheld the lanoxin for 2 days and ordered another blood test to be repeated after 2 days
505    The physician updated the patient's medical record, medication chart and care plan.

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[5] Story board 4 is a summarized version of "What you don't know can hurt Mattie":
http://www.caringfortheages.com/issues/december-2012/single-view/what-you-dont-know-can-hurt-mattie/953a5266cd92911bfe97e1b5025fb3c3.html

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The physician also communicated the revised treatment plan to the SNF nurse assigned to look after this patient.

## Storyboard 5

510 **Care Coordination Environment – contribution, communication, negotiation, sharing and reconciliation/harmonization processes**

**Patient Background**

Adam Everyman is a 46 year-old male, married with 2 children. He was diagnosed as suffering from Type
515 2 diabetes, gastric ulcer, hyperlipidaemia and hypertension, ischaemic heart disease (with recurrent episodes of unstable angina) at age of 45. His height is 178cm (5' 10"), weight is 97kg (213.5 lb) and BMI = 30 (Obese = 30+). He smokes 1 pack of cigarettes per day. He has a comprehensive care plan created by his Primary Care Physician (PCP), Dr Patricia Primary to manage his health problems.

520 In many instances the care plan is managed by a Care Coordinator. This role may be played by different members of the care team. In this story the patient's primary care physician is serving as the Care Coordinator.

PCP Care Plan extract:

| Health concerns | Health Goals | Action plan/Interventions |
|---|---|---|
| Poor blood glucose stabilisation | Understand importance of blood glucose control<br><br>Achieve blood glucose control at levels between 8-10 mmol/L within 6 weeks<br><br>… | • Develop and implement blood glucose control education program with diabetic educator follow-up visits<br>• Weekly patient- dietitian review meeting to plan realistic diabetic diet regime and implementation strategy<br>• Diabetic medication prescription as per national guideline<br>• Fortnightly patient-pharmacist medication review meetings to discuss diabetic medication management strategy<br>• Implement BSL testing regime by patient |
| Difficulty with quitting smoking | ….. | ….. |
| Poor weight control | ….. | ….. |
| Difficulty on adhering to recommended diet | ….. | ….. |
| Poor blood cholesterol control | ….. | ….. |

| Poor blood pressure control | ….. | ….. |
|---|---|---|
| Difficulty with weight control | Reduce BMI to =<27 in 6 weeks (reduce weight by 10kg) | • Develop and implement exercise program with exercise physiologist<br>• Implement and adhere to diet program developed with dietitian |
| ….. | ….. | ….. |
| Inadequate health insurance cover | ….. | ….. |

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**Knee Injury Event**

While Adam was on a skiing holiday with his family a week ago he slipped and fell on an icy path and seriously twisted his both knees. He is seen at the local hospital ER and is referred to see an orthopaedic surgeon.

530 The referral notes from the patient's PCS contain the following information:
- Patient's past medical history: problem, diagnosis, previous procedure(s)
- Current complaint – knee injuries
- Allergy/intolerance list
- Relevant family history (e.g. mother had osteoarthritis of both knees from age of 50)
535
- Reason for referral
- Treatment at ER
  - Including list of known medications

The orthopaedic surgeon accepts the referral and informs the patient the first available appointment to
540 see the patient.

**Orthopaedic encounters**

The orthopaedic surgeon, Dr James Bone requested a number of imaging tests including ultra sound and MRI of the knees

545 The patient also informed Dr Bone that his other medical conditions are care for by his GP who has established a care plan for better management of the health concerns

Dr Bone asks patient for consent to access his comprehensive care plan as information from the PCP care plan may have relevance/implications for the orthopaedic management strategies/plan

The patient provides the consent/access authorisation as requested.

550 After evaluation of patient's imaging results, clinical condition and various treatment options with the patient, Dr Bone recommended a treatment program and developed with the patient an initial orthopaedic care plan.

Dr Bone waits for access to the PCP care plan

555 **Care Plan Synchronization and Technical Reconciliation**

Dr Bone is soon given access to the comprehensive care plan by the PCP

The clinical information system (CIS) from of the Orthopaedic Clinic initiated a plans **synchronization** process that imports the PCP care plan components into the orthopaedic care plan such that the orthopaedic care plan contains relevant components of both plans.

16

560 The CIS decision support (CDS) application performs a **technical reconciliation** which includes the following:

- Component by component comparative analysis of both plans:
  - o Health concerns
  - o Health goals
565  - o Action plan/interventions
  - o Others, e.g. preferences, barriers
- Identifies the differences/conflicts in the two care plans:
  Examples:
  - o The PCP care plan contains exercise programs for weight reduction but the
570     orthopaedic care plan prescribes resting of the knees
  - o The CDS application also highlights the enhanced risks of cardiovascular event to this patient with medical history of unstable angina, which may be caused by the selective cox-2 inhibitor prescribed in the orthopaedic care plan

The orthopaedic surgeon is alerted to the conflicts identified
575


**Communications, Negotiations and Clinical Reconciliation**

The orthopaedic surgeon initiates communication and negotiation processes with the PCP and engages the patient and other relevant healthcare providers in the processes

580 The negotiation may include **proposals** (by the orthopaedic surgeon) to prioritise health concerns, prioritise/change health goals, prioritise or change action plan/interventions

The negotiation and outcome may also include **acceptance**, **rejection** with or without **counter** proposals (by the PCP, patient and/or other healthcare providers) to the proposals.

The negotiation and outcome may also include **acceptance/rejection with qualifier** (agree to disagree)
585 Example:
- Orthopaedic surgeon proposes surgical treatment (e.g. meniscetomy) to fix knee injury
- Patient disagrees and rejects surgical intervention proposal
- Orthopaedic surgeon counter proposes different surgical treatment (e.g. microfracture surgery)
590 - Patient again rejects and counter proposes non-invasive treatment
- Orthopaedic surgeon rejects counter proposal but eventually accepts patient's decision with qualification (agree to disagree)

17
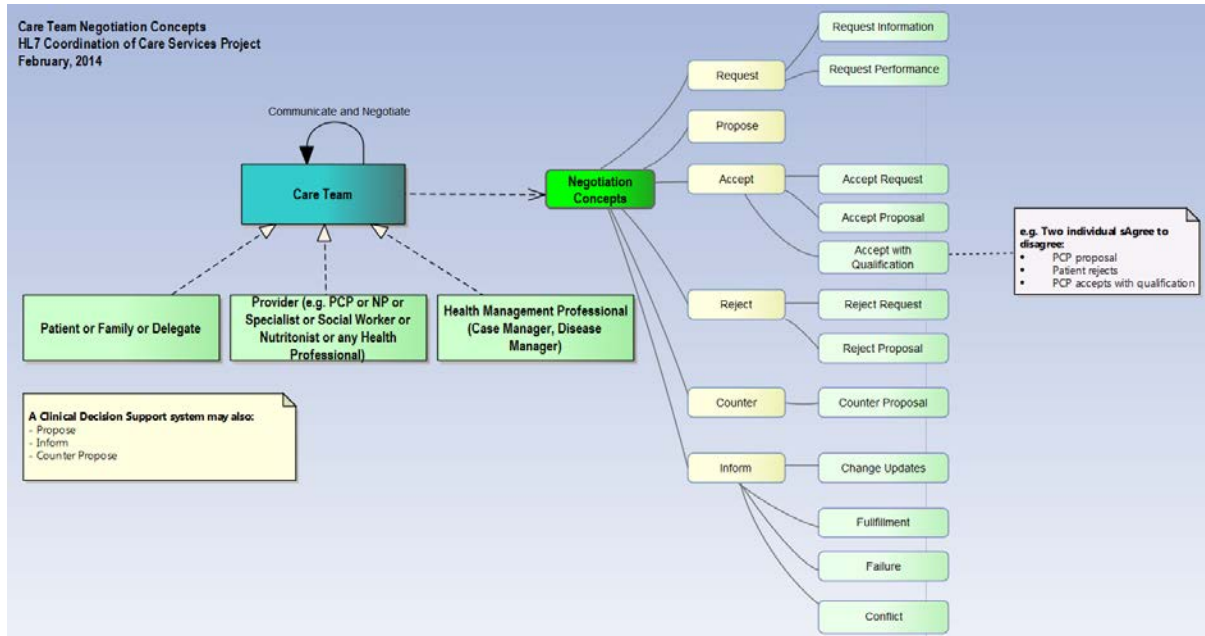
595    The negotiation with PCP on care plan reconciliation involves proposal, counter proposal, as described in the examples above. The process may lead to final acceptance to modify:

- Weight reduction health goal (e.g. achieve BMI reduction from 30 to 29; body weight from 97kg to 92 kg, i.e. 5kg instead of original goal of 10kg)
- Exercise program while the knee injury treatment is in place
600          o   The negotiations may also involve exercise physiologist, dietitian and patient
- Pain management medications to reduce the risks of cardiovascular event eventuating in the patient
          o   The negotiations may also involve pharmacist

The clinical reconciliation resulted from the negotiation processes leads to a harmonized orthopaedic care
605    plan for this patient.


The following illustration based on story board 5 depicts the complexities and importance of coordinated care. Adam Everyman is a man with multiple chronic conditions receiving care in multiple settings. His care would quickly deteriorate without a means for effective communication and the coordinated
610    interaction of his care team.

## Adam's Care Plan: Treatment Options Negotiation

**Adam Everyman**– 46 year old, 178cm (5' 10"), weight is 97kg (213.5 lb), BMI = 30 (Obese = 30+)
**Family:** 2 children | **History:** Smoker - 1 pack a day

**Concerns:**
- Coronary Artery Disease
- Type 2 Diabetes
- Gastric Ulcer
- Hyperlipidaemea
- Weight control

Negotiate Treatment Changes

**Highlights:**
- Prescribe Cox-2 inhibitor
- Patient rejects surgery
- Prescribe resting of the knees

Alternative / Cost Negotiation

- BSL testing
- Modify exercise (kee injury)

Pharmacist Visit

PCP Visit | Diabetic Educator | Nutritionist Visit | Orthopaedic Visits | Home

Exercise Physiologist Visit

Diabetic Educator

Pharmacist Visit

**Comprehensive Care Plan with:**
**Measurable goals**
- Education
- Glucose level in specifc range by a given time
- Reduce BMI within a specific time

**Interventions**
- Medications
- BSL testing
- Periodic advice with Nutritionis and Pharmacist

**New Care Team Member**
- PCP Request's Participation in Coordination of Care Interactions
- Share Care Plan with Orthopaedic doctor

**Provide Information on Treatment Alternatives**
- Deliver information about choices, cost and outcomes
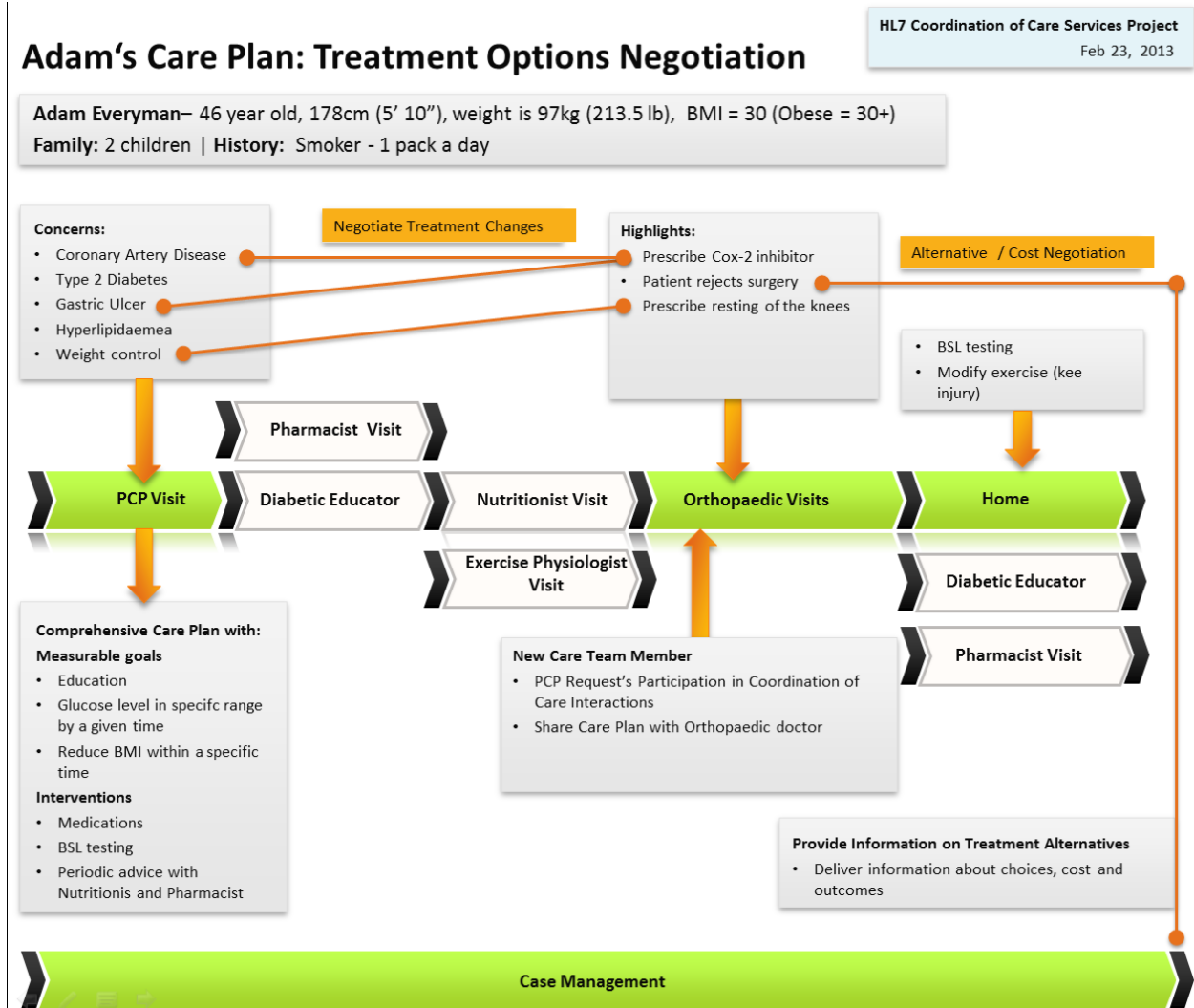
**Case Management**

**Figure 2 Adam's Treatment Options Negotiation**

# 3. CARE TEAM INTERACTION ILLUSTRATIONS

615
The composition of the care team is determined by jurisdictional, organizational, credentialing body policies, and financing mechanisms. Further, it may vary based on the patient's personal and/or family's choice (often within the constraints of the various policies and financing mechanisms). This section assumes the existence of a care team with the goal of establishing the context of ongoing and incremental contributions to the care plan and associated care data. The patient and family are assumed to be part of the care team. A key assumption is that all members of the care team are aware of each other, have been authorized to access the care plan. It is also assumed that each member of the care team is accessing the care plan and coordinating care through a system which implements a specification derived from the service functional model described in this document.

620

625
This section describes the context and pattern of collaboration and interaction paths rather than a fixed process. Coordination of care is framed from the perspective of dynamic evolution of care driven by ongoing evaluation of the patient's health status and collaboration of the dare team. The care team is assumed to have a shared awareness of the changing care plan which is automatically synchronized to all members as it is changed, so as to surface awareness for the need to reconcile and adjust care when new or conflicting information becomes available. Synchronization of the care plan eliminates gaps in information and breakdowns due to missing change updates, conflicting information, and incorporation of new findings. Synchronization can also exposes inconsistencies and helps resolve conflict between specialty views of the plan; helping determine the need for expert clinical reconciliation. It shares information across what previously has been isolated corners of the care continuum.

630

635
The context of care team contribution starts with: Any care team member can "say" anything pertinent at any time resulting in change updates to the shared/synchronized content and resulting in notification to other care team members who in turn can react to the changes. Contribution may result in changing structured elements of the plan, health concerns, health goals, care preferences, health risks, health barriers, or the status and documentation of care activities and interventions. Care team contribution is controlled by the dynamic ongoing negotiation of care team members who may accept, reject and propose alternatives. There are other controls to care team contributions based on organization business rules and policies which are out of the scope of this specification. This specification focuses on the roles of the team members, autonomous decision making, and interaction of individuals who are acting on shared and synchronized content.
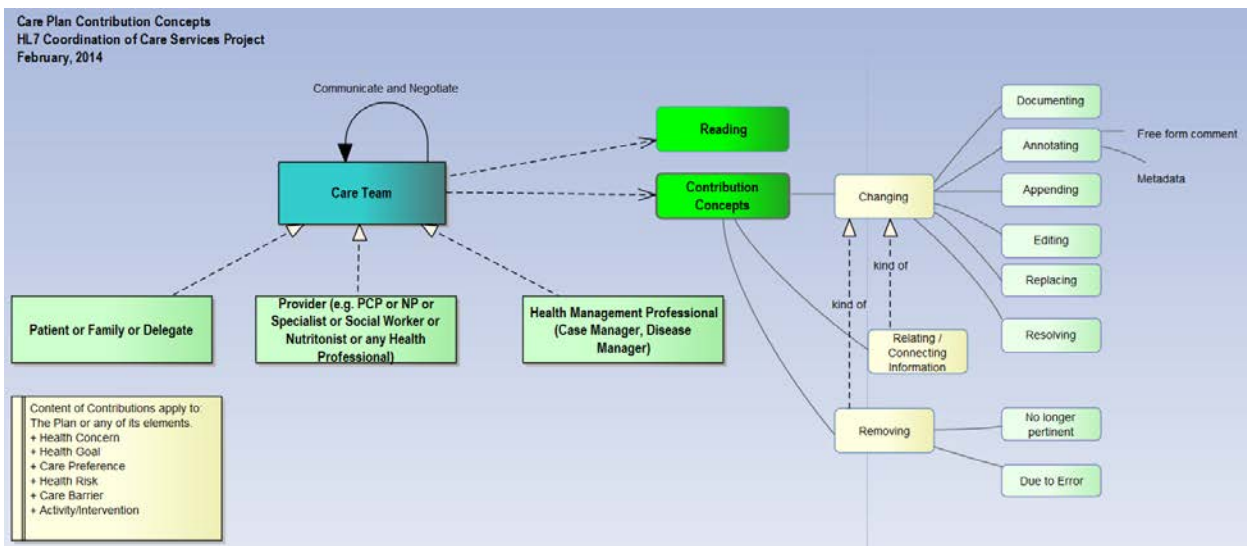
640

**Figure 3 - Care Plan Contribution Concepts**

645    Central to collaboration is the concept of negotiation. Care Team negotiation consist of an emergent and dynamic flow of interactions between two or more individuals as they inform each other, make requests, and make proposals. It also includes actions to accept, reject or counter the requests and proposals in order to reach agreement. It is expected that clinical decision support system agents will also participate in negotiation by proposing, informing and counter-proposing.
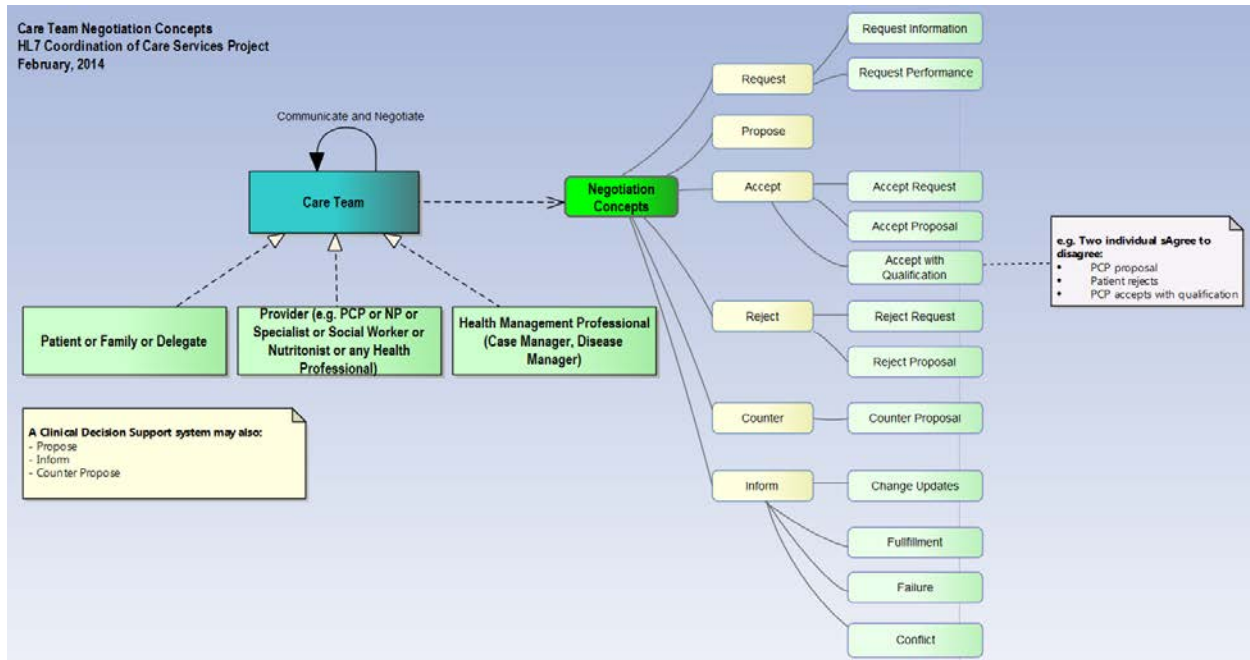


650

**Figure 4 - Care Team Negotiation Concepts**

The diagram in figure 5 provides 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
655    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
660    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
665    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
670    care team members. Care management activities are indicated in the plan.

21

*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.

675 *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.
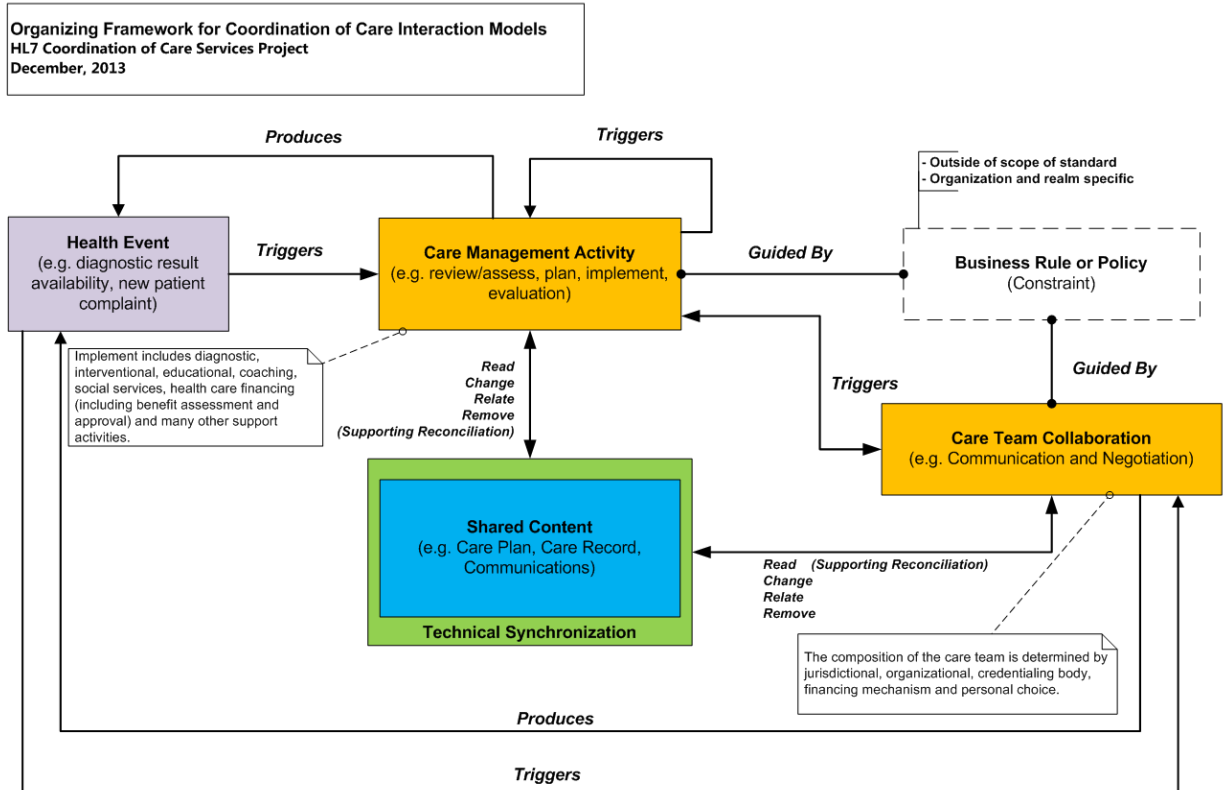


Figure 5 - Organizing Framework for Coordination of Care Interaction Models

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

685

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
690      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

695   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
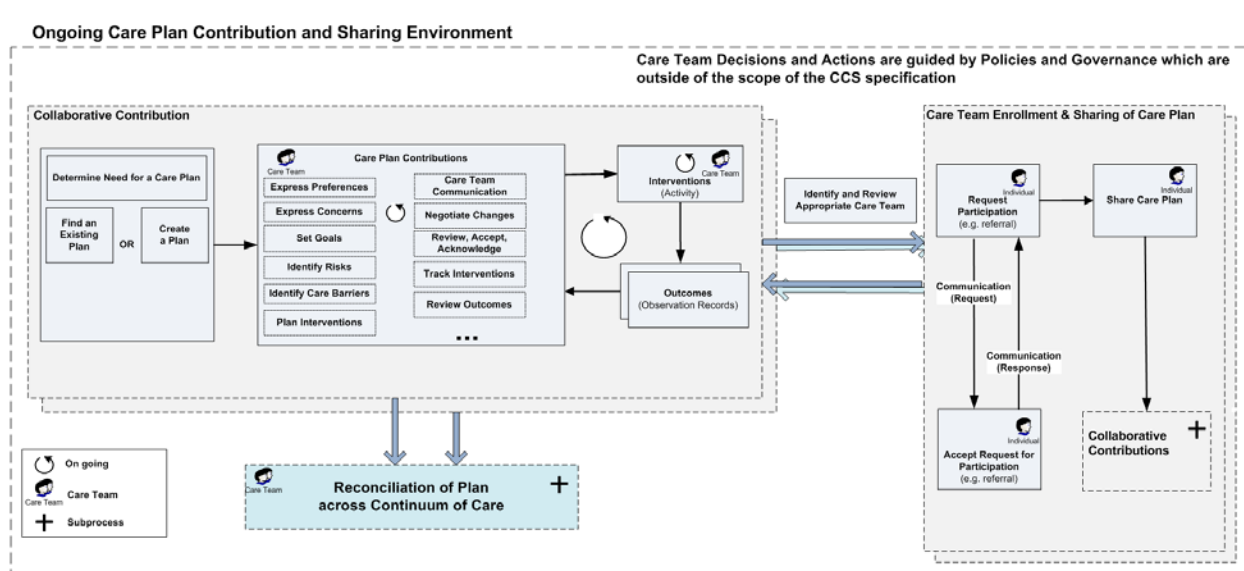      synchronized content change updates.



**Figure 6 – Ongoing Care Team Contribution and Sharing of Care Plan**

700

# 4. SERVICE FUNCTIONAL MODEL

705     The "Coordination of Care" Service Functional Model (SFM) specifies discrete functions or capabilities required for the development of electronic systems which support coordination of care by a collaborating care team. The functional capabilities represent discrete steps in dynamic coordination of care interactions. They may be used in different combinations to help orchestrate the care coordination in collaborative care environments. An important aspect of

710     coordination of care interactions is that they are non-deterministic in nature; interaction emerges and evolves based on expert or autonomous decision making of the care team.

    The capabilities are described in terms of business level pre-conditions, inputs, outputs, exception conditions and post-conditions. The inputs and outputs will have representations mainly as patient care information model classes but sometimes the specification will indicate

715     service centric concepts such as acknowledgements of requests. The pre-conditions, post-conditions and exceptions will only be indicated when significant to the domain (e.g. technical level exceptions, pre-conditions and post-conditions will not be elaborated).
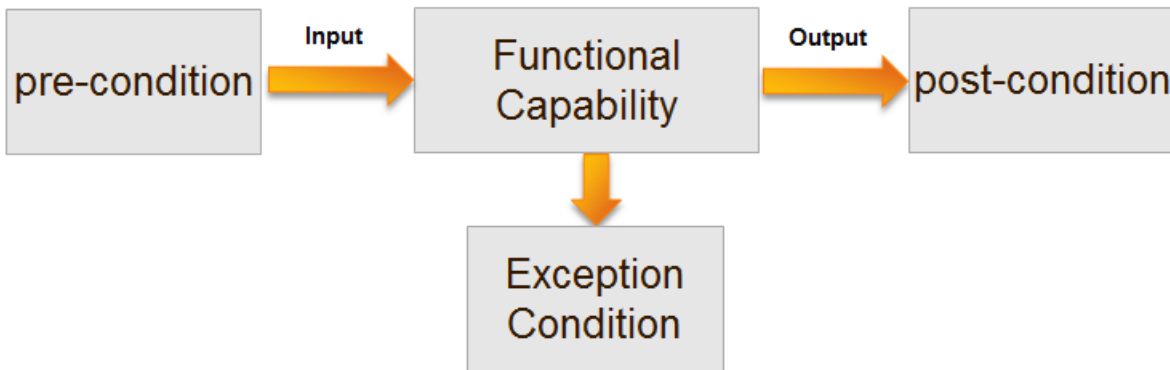


720     **Figure 7 - Structure of a Capability**

> A functional capability as described in this document does not represent a software function implementation. The future technical specification which will be derived from this SFM will provide a technology platform binding which supports interoperable software implementations.

## Governance, Policies and Business Rules

The functional capabilities do not dictate a model for governance, policy or application of

725     specific business rules as these may vary by country and organization. Governance, policies and business rules are a level of constraint which is expected to be applied at the implementation level of a technical specification.

## Perspective

24

730 The perspective taken in the specification of the functional capabilities is grounded in the following concepts:

- Coordination of care is a collaborative activity of care teams (which includes the Patient)
- Coordination of care spans organizational boundaries and settings (including the home)
- Explicit awareness of the identity of the *care team* is a requirement for:
735
  - Determining which individuals require information to prevent misunderstanding and communication gaps.
  - Supporting follow up, feedback, communication.
  - Supporting shared understanding of the patient's care plan and communication of change updates regarding health goals, care preferences, health concerns, health
740
  risks, care barriers, and supporting activities and interventions.

- Care teams acting on a shared and synchronized care plan facilitate non-conflicting and harmonized health goals, care preferences, health concerns, health risks, care barriers and supporting activities and interventions.
745

- The care plan and related clinical content changes based on dynamic contributions over time by a multidisciplinary care team. Information is out of date the moment it is exchanged and therefore supporting care team awareness of changes in a timely manner is crucial in improving care planning and delivery.
750

- A shared and synchronized *care plan* evolves based on on-going care team interactions
  - Information for new health goals, care preferences, health concerns, health risks, care barriers and supporting activities and interventions is pushed to the care team as a result of new interactions (on a need to know basis which respects
755
  organizational rule and policies)
  - Harmonization or reconciliation occurs during interactions since the *care team* has a shared awareness of the *care plan* and ongoing negotiation facilitates resolution of conflicts (at the point of interaction)

760 ## *Assumptions*

This section assumes familiarity with the *HL7 Care Plan* domain analysis model (May 2014 ballot). A glossary of terms is also included in this document.

## *General Grouping of Capabilities*

The capabilities are grouped into related groups as follows:
765
- Care Team Membership Capabilities
- Care Team Communication Capabilities
- Care Team Availability/Scheduling Capabilities
- Care Plan Management Capabilities
770 - Plan Templates
- Plan Resource Support Capabilities

25

- Progress and Outcome Review Capabilities
- Observations and Supportive Content Capabilities

## Care Team Membership Capabilities

775

Coordination of Care is an activity of collaborating care teams. Explicitly maintained knowledge of the currently active care team members, their responsibilities, commitments and contribution to the care of the patient are essential for deciding how to harmonize potentially conflicting decisions and actions, and incorporating new information into a comprehensive and dynamic care plan.

780 The first set of capabilities described support defining who the care team is and how each individual relates to each other. Membership in a patient's care team is a pre-requisite for communication, negotiation and acceptance of individual contributions to a comprehensive patient care plan. The functional capabilities described in this document restrict coordination of care to individuals who have been accepted as members of the care team; care team membership within the coordination of care

785 system (CCS) is a perquisite for interaction based on the capabilities described in this document.

### Request Participation

#### DESCRIPTION:

This capability supports making a request from one individual to another to participate as a collaborator in coordination of care activities for one patient. This request for participation establishes privileged
790 membership into the circle of care for a single patient. Membership is a pre-condition for subsequent interactions resulting from referrals, transitions of care, consultations, etc.

The "request for participation" function assumes the existence of a pre-existing working or social relationship between the participants or organizations involved which enables them to collaborate and
795 coordinate care based on current practice (whether through faxes, phone calls or other means). The issue of which professionals and non-professionals are on the patient's actual care team (and who can receive requests) is an independent issue, iis out of scope for this specification and constrained by country or organization governance and policies.

#### EXAMPLES:

800 - A patient may request participation from a family member or care giver with a stake in the coordination of the patient's care.

- A patient's family member or care giver who has accepted membership to the care team may request participation of another individual such as a provider, care giver, administrative service member, etc.

805

- A primary care provider may request participation from an oncologist after a patient's diagnosis with cancer.

#### SPECIFICATION:

| Preconditions | The request placer must be an existing member of the care team |
|---|---|
| Inputs | • Request placer **:** Person Class |

| | • Request placer role **:** Role Class<br>• Patient **:** Person Class<br>• Request recipient **:** Person Class<br>• Request recipient  role**:** Role Class<br>• Request text or information from request placer **:** Communication Class |
|---|---|
| **Outputs** | • Acknowledgement of receipt of request |
| **Postconditions** | Recipient receives a communication with the details of the request to join the specific patient's care team |
| **Exception Conditions** | |
| **Notes** | • An invitation could be recalled by the sender<br>• An invitation could have an expiration time if not accepted within a given timeframe by the recipient |

810

## Respond to Participation Request

### DESCRIPTION:

The "Respond to Participation Request" capability supports the ability of individuals to accept, reject or delegate an invitation to join a patient's care team.

815 An invitation response results in the addition of a new care team participant upon acceptance. The recipient of the invitation may also reject the invitation or delegate to a colleague.

Allowed response types are:

- Accept participation request

- Delegate participation request to another individual

820 - Reject request to participate

### EXAMPLES:

- An oncologist accepts a primary care provider's request to join the patient's care team.

- A cardiologist delegates request for participation to a colleague due to unavailability or capacity to
825 take new patients.

- An orthopaedic surgeon rejects request to join the care team because a rheumatologist is better suited to manage the patient's health concern/problem.

### SPECIFICATION

830

| **Preconditions** | Existence of a pending request for participation |
|---|---|
| **Inputs** | • Participation request placer **:** Person Class<br>• Patient : Person Class |

27

| | |
|---|---|
| | • Response Type **:** Participation Response Type Class |
| **Outputs** | • Acknowledgement of receipt by sender |
| **Postconditions** | New individual joins the patient's care team and starts receiving change updates. |
| **Exception Conditions** | |

## *Add Care Team Member*

### DESCRIPTION:

835 The "Add Care Team Member" capability supports the ability of an authorized user to directly add members to the care team. The capability assumes the existence of an administrative role which has been granted access to plan and assign members of the care team. This capability can help streamline establishment of the care team when the patient is receiving care within a single institution and an initial group of individuals is identified during care planning.

### EXAMPLES:

840 A patient scheduled for a surgery with an expected inpatient stay lasting more than a week would have an inpatient care team where some individuals are known ahead of time and can be added by an administrative hospital provider.

### SPECIFICATION

| | |
|---|---|
| **Preconditions** | Performer must be an authorized user with rights to assign membership the patient's care team. |
| **Inputs** | • Function performer **:** Person Class<br>• Function performer role **:** Role Class<br>• Patient **:** Person Class<br>• New care team member**:** Person Class<br>• New care team member  role**:** Role Class<br>• Request text or information with reason for addition to be sent to new care team member **:** Communication Class |
| **Outputs** | • Acknowledgement of addition of new care team member |
| **Postconditions** | • New and existing care team members receive communication informing them of new membership and reason as indicated by administrative user.<br>• New individual joins the patient's care team and starts receiving change updates. |
| **Exception Conditions** | |
| **Notes** | Intra-organization use cases should make use of the "Request Participation" capability. |

845

28

## List my Care Teams

### DESCRIPTION:

The "List my Care Teams" capability supports the ability of an individual to list all care teams for which they have an active membership.

850    ### EXAMPLES:

- A man has personal membership to his own care team and to the care teams for his mother and father.

- A provider has a personal membership to her own care team and professional membership the care team for all her patients.

855    ### SPECIFICATION

| Preconditions | Some care team membership |
|---|---|
| Inputs | • Function performer **:** Person Class<br>• Function performer role **:** Role Class<br>• Membership type **:** Membership Type<br>    ○ e.g. Personal membership or Professional membership |
| Outputs | • Zero or more persons  : Person Class |

## Remove Care Team Member

### DESCRIPTION:

860    The "Remove Care Team Member" capability supports the ability of an authorized user to either permanently remove or inactivate an individual from the care team. The capability supports administrative management of the care team. The capability also supports a patient or patient delegate to decide the composition of their active care team and who has access to their plan and progress. Care team members who are permanently removed no longer have access to the care plan. Care team members

865    who are inactivated continue to have access but no longer receive full communication of updates (unless there is an explicit request to re-engage them).

### EXAMPLES:

- A system administrator removes a retired physician or nurse from the patient's care team.

- A patient changes providers and removes their old providers from their care team.

870    - Temporary members added during an inpatient stay are removed from the care team.

- An individual responsible for the care of an elderly parent removes health care specialists no longer involved with the care of the patient.

- A cardiologist sees an individual for evaluation of a murmur.  After a consult and diagnostic tests, the cardiologist says, "The murmur is not significant at this time, but if symptoms develop over time or

875     your PCP advises you should return to see me." The cardiologist is kept as an inactive member of the care team.

## SPECIFICATION

| Preconditions | Performer must be a privileged user with rights to remove individuals from the patient's care team. |
|---|---|
| Inputs | • Function performer **:** Person Class<br>• Function performer role **:** Role Class<br>• Patient **:** Person Class<br>• Care team member to remove **:** Person Class<br>• Removal type : Code Type (e.g. Permanent or Inactive)<br>• Reason for removal **:** Removal Reason Type Cass |
| Outputs | • Acknowledgement of care team member removal<br>• Communication of removal is sent indicating details of removal including date, performing person, patient and reason. |
| Postconditions | • Individual stops being part of the care team. Individual loses access to patient's care plan and associated coordination of care communications. |
| Exception Conditions | |

880     ### *Discover Care Team*

### DESCRIPTION:

The "Discover Care Team" capability supports the ability of a user to determine who the other members of the care team are in order to engage them in communication, negotiation, harmonization and coordinated execution of the plan (via the other capabilities defined in this specification).

885     This capability also supports computer systems in determining who needs to receive change updates and synchronization of the care plan and other coordination of care context and information.

The capability is designed to allow care team individuals to know about each other. In a sense, this capability provides a graph or personal relationships.

890     ### EXAMPLES:

A PCP makes a referral to a cardiologist by sending a "request for participation" in the care team.

The cardiologist subsequently after the first patient encounter sends a "request for participation" to a dietician and physical therapist (who are not known to the PCP).

895     Upon the next review of the care plan by the PCP she would be aware of the new care team members and how their actions and contributions affect the patients plan and progression of their care. The awareness is supported by automatic discovery of new care team members by the system.

30

## SPECIFICATION

| | |
|---|---|
| **Preconditions** | • Determination of the care team is designed for awareness within the patient's extended care circle. It includes only those members who have explicitly sent "requests for participation" to each other; or who have been explicitly added by an administrator via the "add care team member" capability. |
| **Inputs** | • User **:** Person Class<br>• User **:** Role Class<br>• Patient **:** Person Class |
| **Outputs** | • Care team network **:** Care Team Class<br>   o Graph of persons, their relationships and connection history (a network) |
| **Postconditions** | None |
| **Exception Conditions** | |

900

## Care Team Communication Capabilities

Effective care team communication is a key requirement of coordination of care and collaboration. These capabilities support electronic communication between individuals and maintenance of a record of significant coordination of care communications or messages between individuals for future review, 905 understanding and awareness.

It is important to note that for communications to be meaningful for coordination of care they must be associated with the specific clinical context which triggered the communication. For example, the HL7 Care Plan domain analysis model defines communications with explicit associations to health goals, 910 health concerns, health risks, care barriers and plan activities or interventions. For example, a question (communication) about a health goal would be linked to the health goal structure defined in the model; sharing of information about an intervention would have a link to the plan activity as defined in the model.

### *Send Message to Care Team Member(s)*

915 DESCRIPTION:

The "Send Message to Care Team Member(s)" capability supports the ability of a user to send a message to one or more care team members. By default the conversation is private to the participants involved. Organizational policies and business rules may determine if a conversation is visible beyond the direct participants involved.

920

This capability supports both sending of new messages as well as responding to previously sent messages.

Some characteristics of messages:

925 • Messages capture the free form text, natural language expression of business interactions.

• Messages may capture structured observations resulting from electronic form question/answers.

• Messages link to the semantic structure or context pertaining driving the interaction. These links put the communication in context.

• Messages are organized in threads with a common topic.

930 • Messages may contain optional multimedia such as an attached photograph, video clip or document.

EXAMPLES:

• A PCP requests an update from a mental health specialist regarding a special area of concern.

• A patient sends a question to one of her providers

• A patient sends weekly communication to provide a status update in response to a request from her 935 physician to note how they feel about their treatment (capturing the information via a form with structured observations).

• A care team member broadcast an informational message to the entire care team to inform them of a potentially serious side effect requiring changes to treatment and adjustments to the plan.

• A message is sent to the care team during an informal consult with a radiologist to ask if a particular 940 imaging procedure might be indicated for the patient given certain circumstances. The radiologist is

32

not part of the system maintained care team but has the capability to inform or share information with any of them via the "send message" capability.

## SPECIFICATION

| Preconditions | • Messages can only be addressed to care team members for one patient |
|---|---|
| Inputs | • Message **:** Communication Class<br>  o The communication class specifies sender, recipient and links to context and observations. |
| Outputs | Acknowledgement of receipt by receiving systems |
| Postconditions | One or more care team members receive new message / communication |
| Exception Conditions | Transmission errors resulting in failure to send to receiving system |

945

### Include Additional Care Team Member(s) in Communication

## DESCRIPTION:

The "Include Additional Care Team Member(s) in Communication" capability supports the ability of a user to include additional care team members in an existing communication.

950     ## EXAMPLES:

The initial communication after a transition of care is sent to the primary receiving provider. Upon receipt and reading the message the provider decides to include the rest of the care team (after either adding them directly or sending them a request to join the care team).

## SPECIFICATION

955

| Preconditions | • Only individuals who are part of the care team can be added to the communication.<br>• This may require sending the request to participate/join the care team or adding them directly if performed by a privileged user. |
|---|---|
| Inputs | • Message **:** Communication Class<br>  o The communication class specifies sender, recipient and links to context and observations.<br>  o A technical specification based on this capability may choose to use a unique identifier in place of the communication.<br>Multiple entries for:<br><br>• New person to include: Person class<br>• Role of new person : Role Class |
| Outputs | Acknowledgement of receipt by receiving systems |

33

| | |
|---|---|
| **Postconditions** | One or more care team members receive new message / communication indicating that they have been included in a prior / past conversation (to distinguish from a recent interaction). |
| **Exception Conditions** | Transmission errors resulting in failure to send to receiving system |

## *List Messages*

### DESCRIPTION:

960 The "List Messages" capability supports the ability of users to obtain a listing of messages they have either sent or received as part of their active membership in a given patient's care team. Listing of messages may also include filters based on tags which have been applied to the message by users or tags applied to the message by systems.

### EXAMPLES:

- List messages received
965 - List new (unread) messages received
- List messages sent by user
- List messages tagged as removed
- As a PCP list messages tagged for a specific condition

### SPECIFICATION

970

| | |
|---|---|
| **Preconditions** | Existing member of the care team with a history of sent and received messages |
| **Inputs** | <ul><li>User **:** Person Class</li><li>User role **:** Role Class</li><li>Patient **:** Person Class (identifies which care team membership to use)</li><li>One or more tags to use as filters **:** ObjectTag Class<ul><li>E.g. Sent_Messages, Received_Messages, New_Messages</li><li>Or user defined tags such as Cardiology, Diet, Exercise</li></ul></li><li>Start date : Date Class [optional]</li><li>End date : Date Class [optional]</li></ul> |
| **Outputs** | One or more communications or communication threads **:** Communication or Communication Thread Class |
| **Postconditions** | None |
| **Exception Conditions** | |

## *Tag Messages*

### DESCRIPTION:

975 The "Tag Messages" capability supports the ability of users or systems to tag messages for categorization and organization purposes. Tags are used as filters when listing messages.

Three specific tags reserved by systems include: Sent_Messages, Received_Messages and New_Messages.

### EXAMPLES:

980
- A system marks messages as either sent or received in order to support a coherent listing of messages.

- A patient may tag specific messages to organize information based on whatever internal model suites them.

- A primary care provider may organize messages based on specific conditions in order to streamline
985 their use when listing and filtering messages.

### SPECIFICATION

| | |
|---|---|
| **Preconditions** | Existing member of the care team with a history of sent and received messages |
| **Inputs** | <ul><li>User **:** Person Class</li><li>User role **:** Role Class</li><li>Message **:** Communication Class</li><li>One or more to associate with message**:** ObjectTag Class<ul><li>E.g. Sent_Messages, Received_Messages, New_Messages</li><li>Or user defined tags such as Cardiology, Diet, Exercise</li></ul></li></ul> |
| **Outputs** | Acknowledgement of successful application of tags to message |
| **Postconditions** | Message has additional associated metadata tags available for inclusion when listing messages |
| **Exception Conditions** | |
| **Notes** | It is expected that the technical specification will include a complementary operation to also remove user defined messages tags. System assigned tags cannot be removed. |

## *Care Team Negotiation*

### DESCRIPTION:
990

Negotiation is an interaction between two or more parties with the aim to reach agreement. Negotiation is supported in two ways by the coordination of care service functional model.

1. As free form "electronic message" communication resulting in care team individuals taking specific actions

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995            a.   This form is not too different from a phone- or email- based negotiation in that the exchange happens as a conversation with a very specific agreed on decision

2. As a structured content contribution to the care plan which occurs when a care team members adds a health goal, a health concern or a care activity or intervention. Depending on the role and situation, the added goal, concern or intervention may be in a non-finalized proposed state. The proposal could

1000    be accepted, rejected or an alternative could be counter-proposed. The flow in this style of negotiation is one where the care team contributes to the same plan shared content; but the plan or its elements are not accepted (via a team acceptance review) until agreement has been reached.

The modes of communication during the negotiation processes can be asynchronous or synchronous

1005 This capability supports the ability of users to annotate the care plan and its elements as: requested, proposed, accepted, rejected or counter proposed.

## EXAMPLES:

- A patient disagrees that he/she has weight problem (health concern) and rejects that they have to reduce their weight to stay healthy (health goal and intervention).

1010 - An orthopaedic surgeon negotiates treatment changes with a PCP as the Cox-2 inhibitor she is prescribing would require changes to the medications prescribed for the patient's coronary artery disease. The orthopaedic surgeon does this by attaching a proposal and annotation to the previously agreed to interventions for coronary artery disease.

## SPECIFICATION

1015

| | |
|---|---|
| **Preconditions** | • Un-finalized care plan aspects requiring proposals of changes or new issues/new clinical information becomes available necessitate change(s) to care plan<br>• Disagreement on a course of action<br>• Detection of conditions which may lead to an un-harmonized plan and bad consequences |
| **Inputs** | • Initiating user **:** Person Class<br>• Initiating user role **:** Role Class<br>• Focus of negotiation **:** Plan, Health Goal, Health Concern or Care Activity Class (aka Intervention)<br>• Free form expression : Communication Class |
| **Outputs** | • Plan, Health Goal, Health Concern or Care Activity Classes are annotated with ObjectTags capturing the negotiation mode of propose, accept, reject, counter propose |
| **Postconditions** | • Participating care team members receive communication of negotiation response |

**NOTE** – the list of preconditions included the above are examples only. The list is not intended to be exhaustive.

1020

## Care Team Availability/Scheduling Capabilities

### Indicate Availability

#### DESCRIPTION:

1025  The "Indicate Availability" capability supports the ability of users to publish open times in their schedule as well as times when they are not available.

#### EXAMPLES:

- A specialist may publish times he is available to indicate to the collaborating team that he can meet, receive new patients or take additional care responsibilities at the specified times.

- A PCP may indicate that she is off for two weeks of vacation.

1030  #### SPECIFICATION

| Inputs | • Time slots : Schedule Time Slot Class<br>  ○ The time slot indicates a time point or time period for which the individuals is either available or un-available |
|---|---|
| **Outputs** | Acknowledgement availability has been captured by the system |

### Find Person Availability

#### DESCRIPTION:

1035  The "Find Person Availability" capability supports the ability of users to discover when their peers are available for meetings or new appointments with patients.

#### EXAMPLES:

- A cardiologist finds a time to discuss critical plan changes with the patient's primary care provider.

- During a primary care visit the patient makes an appointment request with a social worker.

1040  #### SPECIFICATION

| **Preconditions** | There is a shared care team between the individuals |
|---|---|
| **Inputs** | • Care team members to determine availability **:** Person Class<br>• Time slot prototypes to match **:** Schedule Time Slots |
| **Outputs** | Available schedule time slots for care team member |

37

### *Reserve Person Availability*

#### DESCRIPTION:

The "Reserve Person Availability" capability supports the ability of users to reserve a slot in another care team member's schedule based on information determined from the "Find Person Availability" capability.

#### EXAMPLES:

- A cardiologist reserves a time on the patient's PCP schedule to discuss critical plan changes based on the patient's primary care provider's availability discovered by the find availability capability.

- During a primary care visit the patient makes an appointment request with a social worker.

#### SPECIFICATION

| Preconditions | There is a shared care team between the individuals |
|---|---|
| Inputs | • Request communication : Communication Class<br>    o May indicate a link to a patient : Person Class<br>    o Indicates request reason text<br>    o May indicate a link to any pertinent care plan elements : Any of multiple classes from Care Plan DAM<br> • Requested schedule time slot for care team member : Schedule Time Slot Class |
| Outputs | Acknowledgement of receipt of communication by receiving system |
| Postconditions | A response either immediately or sometime later confirming reservation of time slot |

## Care Plan Management Capabilities

The Care Plan provides guidance for the coordinated effort of the care team. Are care team individuals acting in accordance with the goals established by the patient and her providers? Is everything which was previously planned still the correct course of action upon the identification of new health concerns, risks or barriers. Does the outcome of plan activities by one provider impact the planned course of action agreed upon with a different provider. As time goes on the plan continues to evolve based on contributions from different care team stakeholders and may require harmonization via communication and negotiation. The plan provides a direction to the coordinated activities of the care team; breakdown occurs when the plan stops being maintained. In other words, lack of a dynamically maintained plan results in breakdown of coordinated care.

### *Create Plan*

#### DESCRIPTION:

The "Create Plan" capability supports the ability of a care team member (which includes the patient) to establish a new plan for the patient; or for a patient to create a plan for herself without the need or involvement of other care team members. The capability may not always result in the creation of a

38

complete plan but may simply create the shell of a plan to which one or more care team members in coordinated effort with the patient will contribute information about health goals, heath concerns, health risks, care barriers and plan activities or interventions. The completeness is a matter of perspective and is something that is continuously evolving with future findings so it is expected that whether the created plan is "complete" or a shell it will still undergo changes through contributions by others.

## EXAMPLES:

- A comprehensive plan is created for a patient with multiple chronic conditions by her primary care provider. The plan does not specify much other than identification of health concerns for coronary artery disease, obesity and diabetes mellitus. This shell of a plan is expected to be elaborated with more detail, with achievable goals and interventions during future visits with other specialists. The specific circumstances determine how and when the plan becomes activated for management of a specific condition.

- A healthy patient may create a plan to achieve better health (not driven by a specific health concern)

## SPECIFICATION

| Preconditions | User must be the patient or some other member of the patient's care team |
|---|---|
| Inputs | • Plan **:** Plan Class<br>Require either health concerns or health goals:<br><br>• One or more health goals  **:** Health Goal Class<br>• One or more health concerns   **:** Health Concern Class<br>• Zero or more health risks **:** Health Risk Class<br>• Zero or more care barriers **:** Care Barrier Class<br>• Zero or more planned interventions **:** Care Activity Class |
| Outputs | • Acknowledgement of creation of plan<br>• Notification to care team about existence of new plan |
| Postconditions | • Plan is created and synchronized with patient's care team |
| Exception Conditions | • Unauthorized if individual not a member of the care team<br>• Duplicate or existing plan already in place which could lead to diverging and un-reconciled care. |

## *Change Plan*

## DESCRIPTION:

The "Change Plan" capability supports the ability of care team members (which includes the patient) to make changes to an existing plan. The changes may include modification to intrinsic plan attributes such as confidentiality, description, display name and discipline or changes (including addition) of related plan elements such as health concerns, health goals, health risks, care barriers and plan activity or interventions. A change could also represent the removal of plan elements either because they are no longer pertinent or because they were added due to some error.

## EXAMPLES:

- Plan intrinsic attributes for discipline and description are modified upon identification of new health concerns for coronary artery disease and diabetes mellitus.

- A healed fracture of the leg is removed as a health concern from the plan.

1100

- New interventions are added to the plan to support blood glucose monitoring by the patient at their home.

- A health goal which the patient never agreed to is removed from the plan.

- The priority and success criteria of a health goal are changed by a PCP during conversations with the patient.

## SPECIFICATION

1105

| Preconditions | User must be the patient or some other member of the patient's care team |
|---|---|
| Inputs | • Plan **:** Plan Class capturing the changed intrinsic attributes<br><br>Addition or removal of any of the following:<br><br>• One or more health goals **:** Health Goal Class<br>• One or more health concerns **:** Health Concern Class<br>• Zero or more health risks **:** Health Risk Class<br>• Zero or more care barriers **:** Care Barrier Class<br>• Zero or more planned interventions **:** Care Activity Class<br><br>• Changes to intrinsic properties of health concerns, health goals, health risks, care barriers and care activity |
| Outputs | • Acknowledgement of successful modification of plan<br>• Notification to care team about changes to the plan<br>• Synchronization of the plan change updates to shared copies of the plan |
| Postconditions | Plan is updated and care team is aware of change updates |
| Exception Conditions | |
| Notes | This capability will expand into multiple technical specification operations to support making changes to different component parts of the plan. |

## *Monitor Change*

## DESCRIPTION:

1110
The "Monitor Change" capability supports the ability of users to indicate their desire to be alerted regarding specific changes to the care plan content such as health concerns, health goals, health risks, care barriers, care preferences and care activities or interventions. As specified by the "Synchronize Plan" capability, the care plan content is already expected to be synchronized across all shared instances. The key distinction of the "Monitor Change" capability and basic synchronization is that synchronization is a

1115 passive behavior of the system; whereas "Monitor Change" supports intentional and proactive care team behavior.

### EXAMPLES:

- A coordination of care system is set up so that some providers can monitor addition of new health concerns so that they can reevaluate the plan and potentially harmonize changes from other care team providers.
1120
- A case manager may monitor unmet goals for a patient in order to follow up with care team stakeholders.

### SPECIFICATION

| Preconditions | Existing plan is in place and the care team which includes the patient has agreed to it. |
|---|---|
| Inputs | <ul><li>One or more care team members (including patient) interested in monitoring **:** Person Class</li><li>Monitor criteria **:** Criterion Class<ul><li>These are rules that define what to monitor</li></ul></li></ul> |
| Outputs | A communication linked to associated plan element **:** Communication Class |
| Postconditions | Users receive communication with links to plan element and criteria used as the trigger |

1125 ### *Find Plan*

### DESCRIPTION:

The "Find Plan" capability supports the ability of care team members to discover existing plans for a patient in order to make the plan accessible for reading, reviewing and changing. The resulting plans may be either active or archived. Ideally there is one active plan for a patient as the capabilities do not support
1130 coordination of care based on multiple un-reconciled plans.

### EXAMPLES:

A patient presents to an appointment with their cardiologist. The cardiologist who was previously requested to participate in the care team via a PCP referral looks up the existing plan to review with the patient.

1135 ### SPECIFICATION

| Preconditions | Individual must either be a patient or another member of the care team in order to look up a plan. |
|---|---|
| Inputs | <ul><li>User **:** Person Class</li><li>User role **:** Role Class</li><li>Patient **:** Person Class</li></ul> |

| Outputs | • Plan **:** Plan Class<br>    o The plan class has associations to health concerns, health goals, health risks, car barriers, patient preferences, care activities, etc.<br>    o These associated elements are available to the individuals requiring access to the plan. |
|---|---|
| Postconditions | • Plan becomes accessible to care team member |
| Exception Conditions | • Unauthorized if individual not a member of the care team |

## *Synchronize Plan*

### DESCRIPTION:

1140 The "Synchronize Plan" capability supports system level data synchronization of changes to the care plan for all care team participants who have accessed an earlier version of the plan and who may make mistakes unless they are aware of changes to the plan. The capability supports users by providing an up to date view and awareness of changes to the plan by other care team members. Synchronization of change updates to the coordinating care team raises awareness of potential changes resulting from new

1145 findings.

### EXAMPLES:

A patient is discharged from a hospital and transferred to a skilled nursing facility. There are pending diagnostics tests at the time of discharge. A day later upon review of the test results the responsible provider determines the abnormal lab results indicate the patient medications must be changed

1150 immediately. The provider proposes changes to the plan which are synchronized to other coordinating care team member version of the plan; making the changes available to the attending provider at the skilled nursing facility so they can avoid unnecessary complications.

### SPECIFICATION

| Preconditions | Multiple care team members with access to the plan which becomes out of date when modified by another care team member possibly in a different setting and organization. |
|---|---|
| Inputs | Change updates: Requires a system level synchronization protocol to be determined at the technical specification level. |
| Outputs | Production of change update summary with special emphasis in tracking changes with temporal significance. |
| Postconditions | Out of date versions of the plan held by coordinating care team members are updated |
| Exception Conditions | System level unavailability exceptions which may require re-attempting the synchronization process. |

1155

## *Close the Plan*

### DESCRIPTION:

The "Close Plan" capability supports the ability of users to indicate a plan is no longer used.

1160 ### EXAMPLES:

- Patient heals and provider decides to create a brand new plan and closes existing plan (instead of changing the existing plan which is also an option).
- Duplicate plan is closed.
- Patient dies and plan is closed.

1165 ### SPECIFICATION

| Preconditions | An active or current plan |
|---|---|
| Inputs | User **:** Person Class<br><br>User role **:** Role Class<br><br>Patient **:** Person Class |
| Outputs | The status of the plan is set to "closed" |
| Postconditions | • The plan is no longer available for use and modification by the care team.<br>• The plan will be available as a result in the find plan capability when if the query indicates retrieval of historical plans. |
| Exception Conditions | |

## *Tag Plan Items*

### DESCRIPTION:

1170 In the world of paper care plans, one could take a red pen and make "markings" to identity items of interest for planning and discussion. As an example, these markings may indicate to follow up, to correct, to consolidate or reconcile various plan sections or items.

The "Tag Plan Items" capability supports the ability of users to make such markings by tagging any object within the plan with a label (which could be a predefined or coded label). The markings could be either
1175 system defined or user defined.

Markings with the same label or code form groupings of related content for organizational purposes or to highlight them for future action by the care team.

### EXAMPLES:

- Care team members may tag conflicting goals that need to be discussed
1180 - Care team members may tag two plans to merge

43

- Care team members may tag plan items requiring review or follow-up.

**Example Tags:** Follow up item, Conflicting item, Duplicate item, No Longer Relevant Item, Item Review required

1185 SPECIFICATION

| Preconditions | User is a member of the care team |
|---|---|
| Inputs | <ul><li>User **:** Person Class</li><li>User role **:** Role Class</li><li>Tag **:** ObjectTag Class<ul><li>Captures label or code</li><li>Timepoint or time period for which the tag is relevant</li><li>A reference to one or more target objects from the plan to which the tag is applied</li></ul></li></ul> |
| Outputs | Acknowledgement confirming tagging was successful |
| Postconditions | Application of tags is synchronized to plans held by other care team members |
| Exception Conditions | |
| Notes | The reverse capability to untag or to remove a tag should also be supported by the specification. |

### *Lookup Tagged Items*

### DESCRIPTION:

1190 The "Lookup Tagged Items" capability supports users in identifying plan items tagged with a given label. Tag with the same label or code form groupings of related content for organizational purposes or to highlight them for future action by the care team.

### EXAMPLES:

- List items tagged for reconciliation
1195 - List post discharge items tagged for follow up
- List conflicting items tagged by clinical decision support agent

### SPECIFICATION

| Preconditions | User is a member of the are team |
|---|---|

| | |
|---|---|
| **Inputs** | User **:** Person Class<br><br>User Role **:** Role Class<br><br>Patient **:** Person Class<br><br>Tag **:** ObjectTag Class to be used as prototype for query<br><br>• May indicate applicability time period (as tag may no longer be "active") |
| **Outputs** | Information used by computer system to locate and present tagged plan objects to user |
| **Postconditions** | |
| **Exception Conditions** | |

1200

## *Capture Care Plan Snapshot*

### DESCRIPTION:

The "Capture Care Plan Snapshot" capability supports the ability of users or systems capture a point in time snapshot of the electronic care plan.

1205　This capability was created to support interoperability with systems which may receive document snapshots of the care plan.

### EXAMPLES:

An administrator generates a snapshot and then prints it or exports as a CDA document in order to send to a different provider who does not have access to a CCS enabled system. The capability supports
1210　capturing the snapshot and exporting it. Users may send via email or fax or use any other external application at their disposition.

### SPECIFICATION

| | |
|---|---|
| **Preconditions** | The plan is in a consistent and harmonized state. This is important as a dynamically changing plan which is actively receiving contributions from various care team members needs may have details at various levels of acceptance and review. |
| **Inputs** | User requesting snapshot **:** Person Class<br><br>Role of user requesting snapshot **:** Role Class<br><br>Patient **:** Person Class |
| **Outputs** | A care plan snapshot document. An electronic document which could be printed or transmitted through the use of external tools. |

1215

45

## Import Care Plan Snapshot

### DESCRIPTION:

The "Import Care Plan Snapshot" capability supports the ability of users to receive an existing electronic care plan snapshot document and import into the system.

1220 ### EXAMPLES:

- Some provider may generate a care plan snapshot from their electronic health record and export as a care plan snapshot to include in a referral to a care team which has a CCS enabled system. The CCS enabled system would import the care plan snapshot.

### SPECIFICATION

1225

| Preconditions | |
|---|---|
| Inputs | A care plan snapshot document |
| Outputs | Acknowledgement of successful import of the care plan snapshot into the CCS system |

## Plan Templates

1230 A plan template consists of predefined "standardized" plan elements which are commonly included when addressing a combination of patient health concerns, health risks and health goals. The plan templates could be based on research, clinical evidence or best practices. For example, there could be a plan template to treat patients with diabetes mellitus and cardiovascular disease; these templates could be used by a provider as a starting basis to customize and personalize the care for an individual.

### *Find Plan Template*
1235

### DESCRIPTION:

The "Find Plan Template" capability supports the ability of users to locate a predefined "standardized" plan fragment to address a subset of health concerns, health goals and health risks. Users are expected to personalize and tailor the "plan" based on the patient's needs and preferences.

1240 Plan templates are not associated with individual patients but instead capture re-usable plan elements targeting classes of patients sharing health concerns, health risks and health goals.

### EXAMPLES:

- A provider looks up a plan template based on guidelines for treating patients with diabetes mellitus and subsequently customizes and personalizes a plan for her patient.

### SPECIFICATION
1245

| | |
|---|---|
| **Inputs** | • One or more health concerns **:** Health Concern Class<br>• One or more health goals **:** Health Goal Class<br>• One or more health risks **:** Health Risk Class |
| **Outputs** | A Plan **:** Plan Class<br><br>• Same plan class used for a patient but with no associations to a  patient or other care team members. |

### *Define Plan Template*

### DESCRIPTION:

1250 The "Define Plan Template" capability supports the ability of users to create or update condition specific re-usable plan "fragments".

This capability is similar to creating or changing a plan, except that the plan does not specify a patient or any other member of the care team.

### EXAMPLES:

1255 • A research organization or clinical content vendor creates a plan template based on nationally recognized guidelines and evidence for treatment of diabetes mellitus.

## SPECIFICATION

| Preconditions | User has administrative privileges to publish a plan template or a plan template update |
|---|---|
| **Inputs** | User : Person Class<br><br>User role : Role Class<br><br>A plan **:** Plan Class<br><br>• A fragment plan containing health concerns, health goals, health risks and activities/interventions. |
| **Outputs** | Acknowledgement of creation or update of plan template |
| **Postconditions** | Plan fragment representation is stored for retrieval via "Find Plan Template" |
| **Notes** | The technical specification needs to consider how to represent relative times and timeframes. |

1260

# Plan Resource Support Capabilities

Carrying out a plan requires allocation of resources required to support the activities of the care team. Resources include human resources, assets such as room and equipment resources, service resources and consumable material resources such as surgical consumables, medicines and controlled substances.

1265   The care plan domain analysis model includes descriptions and relations of resources to activities included in the plan.

The following capabilities make use of the Resource Allocation class as defined in the Care Plan domain analysis model. The resource allocation represents either a consumable, service or asset allocation which has is either inspected, requested or booked by a user.

1270   *Find Available Resources*

## DESCRIPTION:

The "Find Available Resources" capability supports the ability of users to determine specific resources which can be allocated for use in the support of an activity.

## EXAMPLES:

1275   • A nurse planning a surgery needs to find a surgery room, a surgery care team, surgery equipment and drugs required during the surgery.

## SPECIFICATION

| Preconditions | A defined plan activity or intervention supporting the request |
|---|---|
| **Inputs** | • Requesting User **:** Person Class |

|  | • Requesting user role **:** Role Class<br>• Activity to support request : Activity Class<br>• Patient **:** Person Class<br>• Resource allocation prototype **:** Resource Allocation Class (as a prototype for system query) |
|---|---|
| **Outputs** | One or more resources which can be allocated : Resource Allocation Class |
| **Postconditions** |  |
| **Exception Conditions** |  |

1280 ### *Allocate Resource*

### DESCRIPTION:

The "Allocate Resource" capability supports the ability of users to request booking or directly book resources for use in support of planning and execution.

### EXAMPLES:

1285 • A medical assistant reserves services for MRI for a patient.

### SPECIFICATION

| **Preconditions** | Proposed or planned care activity/intervention requires use of resources |
|---|---|
| **Inputs** | Resource allocation : Resource Allocation Class |
| **Outputs** | Acknowledgement of receipt of request or booking of resource |
| **Postconditions** | Resource is reserved and not available to others for booking |
| **Exception Conditions** | Resource no longer available for request or direct booking |

### *Cancel Resource Allocation*

1290 ### DESCRIPTION:

The "Cancel Resource Allocation" capability supports the ability of users to indicate they no longer require a resource. The cancel resource allocation capability makes the resource available for use or booking by others.

### EXAMPLES:

1295 A patient cancels their appointment and an MRI machine becomes available for use by other patients during the specified time slot.

49

## SPECIFICATION

| Preconditions | |
|---|---|
| Inputs | <ul><li>Requesting user **:** Person Class</li><li>Patient **:** Person Class</li><li>Resource allocation to cancel **:** Resource Allocation Class</li></ul> |
| Outputs | Acknowledgement of cancellation |
| Postconditions | Care team is released from responsibility over the resource allocation |
| Exception Conditions | Unable to cancel for some business reason |

1300

## Progress and Outcome Review Capabilities

The review capabilities enable users to capture their evaluation of whether the plan is progressing as expected based on review of goals and outcomes. Acceptance is also included as a form of review capability which captures shared agreements, authorizations, and acknowledgements to move forward
1305 with a planned course of action.

### *Review*

## DESCRIPTION:

The "Review" capability supports the ability of users to perform ongoing evaluation of the dynamic care
1310 plan as it changes through time based on the contribution, negotiation and harmonization by the care team. A review may apply to the plan as a whole, to an individual goal or to the outcome of a specific intervention. The review may consider the overall consistency, appropriateness, completeness and effectiveness of the plan or selected goals. A review may be captured as a set of qualitative observations or it may capture quantitative measure when computable criteria for the goal or intervention results are
1315 available.

## EXAMPLES:

A patient after a surgery undergoes weekly reviews of his care plan to assess effectiveness of treatment and any adjustments which may need to be made to prevent a re-admission.

## SPECIFICATION

1320

| Preconditions | Existence of a target plan, health goal or activity to review |
|---|---|
| Inputs | <ul><li>Target element under review : Plan, Health Goal, or Activity Class</li><li>Plan, goal or outcome review **:** Review Class<ul><li>The review class specifies the reviewers/participants</li></ul></li><li>Patient  : Person Class</li></ul> |

| Outputs | Acknowledgement review was captured |
|---------|-------------------------------------|

## *Acceptance Review*

### DESCRIPTION:

1325 The "Acceptance Review" capability supports the ability of users to indicate their agreement (or disagreement), acknowledgement or authorization of an overall plan, individual health goals and proposed activities.

An affirmative acceptance can be taken away through this capability.

### EXAMPLES:

1330 • Upon review of the goals and planned activities, a care manager (e.g. nurse case manager, social worker, physical therapist, or pharmacist), primary physician, 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.

• A patient expresses disagreement with the care plan.

1335 • A patient changes his mind about the surgery and rejects the parts of the plan pertaining to the surgery.

### SPECIFICATION

| Preconditions | |
|---------------|--|
| Inputs | • Target element to accept or reject : Plan, Health Goal, or Activity Class<br>• Acceptance review **:** Review Class<br>• Patient : Person Class |
| Outputs | Acknowledgement acceptance (or lack of acceptance) was captured |
| Postconditions | Care team is aware of state of acceptance of the plan |
| Exception Conditions | |

1340

## Observations and Supportive Content Capabilities

These capabilities support users in capturing and linking historical information as well as information resulting from new interactions.

### Make Observations

1345 DESCRIPTION:

The "Make Observations" capability supports the ability of users to capture observations made at any stage of the care process or during interactions.

#### EXAMPLES:

- Subjective and objective observations are made in support of the assessment and screening
1350   processes.
- Observations captured as intervention outcomes
- Observations captured as results of forms questionnaires (and linked to communications)
- Observations captured as results of assessment scales and instruments (e.g. for activities of daily living)

1355 SPECIFICATION

| Preconditions | |
|---|---|
| Inputs | • One or more observations **:** Observation Class<br>   o The observation maybe objective or subjective in nature<br>• Metadata used to group and categorize the observations **:** ObjectTag |
| Outputs | • Acknowledgement observation was captured<br>• New observations are synchronized as shared coordinated care team content |
| Postconditions | |
| Exception Conditions | |

### Query Observations

1360 DESCRIPTION:

The "Query Observations" capability supports the ability of users to query observations captured during coordination of care.

#### EXAMPLES:

- Review a patient's weekly diary entry observations for the last year

52

1365     •    Review last recorded information about activity of daily living observations.

## SPECIFICATION

| Inputs | •   Observation Type : Code Class<br>•   Observation time frame : TimePeriod Class |
|---|---|
| Outputs | One or more observations **:** Observation Class<br><br>     •   Assume technical specification will provide a sort of container for organizing purposes |

### Associate Supportive Content

1370 ### DESCRIPTION:

The "Associate Supportive Content" capability supports the ability of users to associate relevant historical content to an active plan. This historical content may originate from either prior non-active plans or from the patient's care record.

### EXAMPLES:

1375     •    A kidney transplant procedure note would stay relevant to care planning for the life of the patient.

    •    Active allergies, medications, procedures, diagnostic tests from a summary of care record.

    •    Interventions captured in historical plans with continuing significance to care team decision making for future planning.

### SPECIFICATION

1380

| Inputs | •   One or more historical activity and observation : Activity or Observation Class<br>•   Metadata categorizing activity or observation : ObjectTag Class |
|---|---|
| Outputs | Acknowledgement of association |
| Postconditions | Linked/associated historical supportive content is available to care team |

### Remove Supportive Content

### DESCRIPTION:

1385 The "Remove Supportive Content" capability supports the ability of users to logically remove supportive content which is no longer relevant. As with any removals in health care systems, the information continues to be available for auditing.

### EXAMPLES:

    •    Information related to a prior pregnancy is removed

53

- Information entered in error is removed

1390    SPECIFICATION

| Preconditions | |
|---|---|
| Inputs | • Identity of linked activities and observations to remove : Activity or Observation object/instance identities |
| Outputs | Acknowledgement of removal |
| Postconditions | Changes are synchronized across shared coordinated care team content |
| Exception Conditions | |

## Reconciliation Process Support

1395    ### *Care Plan Technical Reconciliation*

### DESCRIPTION:

1400    The "Care Plan Technical Reconciliation" capability supports the ability procure and merge two different care plans. The procurement can be done through queries to external sources (such as clinical information systems or electronic health record) or through inputs of care plans pushed from external sources. This capability include functions such as validation and highlighting of patient identification details, identification of care plan contents duplicates, overlaps, conflicts and superseded information to facilitate clinical reconciliation

### EXAMPLES:

- Reconciling an orthopedic care plan and a PCP care plan
1405    - Reconciling multiple discipline specific care plans into comprehensive/integrated care plan

### SPECIFICATION

| Preconditions | Patient authorizes access to an external care plan |
|---|---|
| | A discipline specific care plan or care plan component is received from another health care provider |
| Inputs | • External care plan(s): Plan Class<br>• Internal care plan (which may be an comprehensive care plan) |
| Outputs | Highlights of duplicates, overlaps, conflicts and superseded information between two or more different care plans |

| | Technical reconciliation recommendations for clinical approval |
|---|---|
| **Postconditions** | Technically reconciled care plan |
| **Exception Conditions** | |

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## Care Plan Clinical Reconciliation

### DESCRIPTION:

The "Care Plan Clinical Reconciliation" capability supports clinical adjudication of discrepancies between two or more care plans from different sources. The adjudication may involve resolving any ambiguities
1415 duplications, inconsistencies, contradictions, errors and omissions that may be identified through the technical reconciliation and clinical validation. Clinical reconciliation process may often include communications/negotiations with different stakeholders including the patient

### EXAMPLES:

- Clinical reconciling an orthopedic care plan and a PCP care plan by an orthopedic surgeon

1420 - Reconciling multiple discipline specific care plans into comprehensive/integrated care plan by a care manager (who may be a PCP or a Nurse Care Manager)

### SPECIFICATION

| **Preconditions** | Care Plan management and CDS applications alerts to completion of technical reconciliation and need for clinical validation |
|---|---|
| **Inputs** | <ul><li>External care plan(s): Plan Class</li><li>Internal care plan</li><li>Highlights of plan component discrepancies</li></ul> |
| **Outputs** | Clinical validation, reconciliation and approval |
| **Postconditions** | Clinically reconciled care plan |
| **Exception Conditions** | |

## 5. PROFILE GROUPING

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A profile is a named set of cohesive capabilities. A profile enables a service to be used at different levels and allows implementers to provide different levels of capabilities in differing contexts. Service-to-service interoperability will be judged at the profile level and not the service level. Note that through the use of profiles, there are no "optional" interfaces. Conditions that might otherwise

1430 merit this optionality should be addressed via a dedicated profile.

There is no interoperability at the service functional model level and so these profiles simply indicate grouping of the service functional model capabilities in order to inform the future HL7-OMG technical services specification.

This section references the capabilities defined in section four of this document. Please refer to the
1435 specific capability for understanding of the function specification and illustrative examples.

## Care Team Communication

Collaboration and communication is crucial to the coordinated effort of individuals working towards shared goals and acting based on a shared plan. Collaboration arises through the capability of
1440 communication, negotiation and technical synchronization plan changes which can be monitored by individuals.

This profile includes capabilities as described in section four of this document:

- Care Team Membership Capabilities
- Care Team Communication Capabilities
1445 - Care Team Availability/Scheduling Capabilities

This profile is important but limited in that it does not support dynamic contribution to the care plan as a reaction to a collaborative interaction.

1450 ## Care Planning and Execution – Dynamic Care Team Contribution

Collaboration and communication is crucial to the coordinated effort of individuals working towards shared goals and acting based on a shared plan. But the plan is not static; the plan changes dynamically through time in unexpected ways through the interaction of the care team (which includes the patient). Communication gaps may arise if these dynamic changes are not synchronized and
1455 made available for care teams to react based on change updates. Reaction to plan changes by the care team result in further contribution and changes to the plan; these changes in turn solicit reaction from other care team members in order to maintain a reconciled state.

This profile requires the "Care Team Communication" profile and includes additional capabilities as described in section four of this document:

1460 - Care Plan Management Capabilities
- Plan Resource Support Capabilities
- Progress and Outcome Review Capabilities
- Observations and Supportive Content Capabilities

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## Clinical Decision Support (CDS)

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A clinical decision support agent may serve as an automated contributor to the plan by proposing, informing and counter-proposing changes to the plan at any state in the process. The agent may be seen as an external observer that intercepts the request and responses of functions defined by the following capabilities:

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- Care Plan Management Capabilities
- Plan Resource Support Capabilities
- Progress and Outcome Review Capabilities
- Observations and Supportive Content Capabilities

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In addition, of special interest to a CDS agent observer is the capability to "Monitor Change" as described in the "Care Plan Management Capabilities" subsection (from section 4).

## Plan Content Publishing

This profile supports the organizations in defining content based on accepted best practices. This
1480
profile would include capabilities as described in the following sections:

- Plan Templates

# APPENDIX A - RELEVANT STANDARDS

1485 Existing standards relate to the Coordination of Care Service Specification at two levels.

1. At the service functional model (SFM) level

2. At the Service Technical Model (STM) level [future work]

1490 The ecosystem of related standards is broad in scope. Keeping these viewpoints in perspective will help focus the discussion as the effort progresses from the current functional model DSTU and subsequently to technical service model. The current focus of the effort is the service functional model level or view point one.

**Functional Model Level:**

At the service functional model (SFM) level the key dependencies are:

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1. Clinical domain or semantic models to support the input and output of the functions or capacities

   - The HL7 Care Plan Domain Analysis Model is the primary model used for this specification

2. HL7 CDA document may be used to create point in time snapshots of the care plan and continuity of care record.

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   - The CDA is a technical specification but mentioned here to directly address how it relates to the service specification.

3. Terminology bindings are essential for semantic interoperability in coordination of care communities.

   - A separate patient care workgroup project will address these requirements.

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**Technical Specification Level** [future work]**:**

The technical specification level needs to consider:

1. Use of widely adopted web, W3 and IETF standards

2. Light weight security, authentication and authorization standards

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# APPENDIX B – RELATIONSHIP TO INFORMATION CONTENT

The *Coordination of Care Service Functional Model* depends on domain analysis models developed by the *HL7 Patient Care Work Group.* This specification does not define new semantic or domain content models.