

iPa²-Guide

The iPAAC Patient Pathway Guide

A Guide for the Development of Generic Patient Pathway Templates and Their
Implementation in Comprehensive Cancer Care Networks

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Table of Contents

List of Figures	4
List of Tables	5
List of Abbreviations.....	6
1 Background	7
2 Patient Pathways in Comprehensive Cancer Care Networks	9
2.1 Definition of Patient Pathways	9
2.2 Patient Pathway Usage Scenarios.....	10
2.3 Expected Benefits.....	11
3 Harmonisation and Standardisation of CCCN Care Using Patient Pathway Templates. 12	
3.1 Project Institution for Patient Pathway Template Development.....	12
3.2 Systematic Collection and Review of Evidence	14
3.3 Patient Pathway Template Construction	15
3.4 Template Dissemination and Evaluation.....	18
4 Implementation and Usage of Patient Pathways in CCCNs	19
4.1 Project Institution for Template-Based Patient Pathway Development in CCCNs. 19	
4.2 Adaptation of Patient Pathway Template to CCCN Specifics.....	20
4.3 Implementation and Evaluation of Patient Pathway in CCCN	21
5 Example Use Cases	25
5.1 Background.....	25
5.1.1 Relation to other iPAAC Results	25
5.1.2 Representation of Patient Pathways	25
5.2 Colorectal Cancer Patient Pathway Template.....	27
5.3 Pancreatic Cancer Patient Pathway Template.....	35
5.4 Patient Pathway Development Tool.....	41
5.5 Lessons Learned from Piloting	42
6 Summary and Conclusion.....	43
7 References	44

List of Figures

Figure 1. Usage scenarios of the template-based patient pathway approach.....	10
Figure 2. Process of the patient pathway template construction phase	15
Figure 3. Process landscape view on the CRC patient pathway template	27
Figure 4. Overall structure of the colorectal cancer patient pathway template	28
Figure 5. CRC patient pathway template - parts "CCCN entry" and "diagnosis".....	29
Figure 6. CRC patient pathway template – part “treatment planning”	30
Figure 7. CRC patient pathway template – part “treatment / end-of-life care“	31
Figure 8. CRC patient pathway template – parts “follow-up“ and “end of CCCN care“	32
Figure 9. CRC patient pathway template – detail “patient consultation“.....	33
Figure 10. CRC patient pathway template – detail “patient consultation after diagnosis“.....	34
Figure 11. Overall structure of the pancreatic cancer patient pathway template	36
Figure 12. PC patient pathway - parts "CCCN entry" and "diagnosis"	37
Figure 13. PC patient pathway - part "treatment planning"	38
Figure 14. PC patient pathway – part "treatment/ palliative care / end-of-life care".....	39
Figure 15. PC patient pathway – parts "follow-up“ and “end of CCCN care“.....	40
Figure 16. iPAAC patient pathway (template) repository	41
Figure 17. Quality indicator representation and specification in the iPAAC modeller.....	42

List of Tables

Table 1. Scientific foundation of the iPa ² -Guide	8
Table 2. Roles and qualifications of template development team members	13
Table 3. Roles and qualifications of CCCN patient pathway development team members...	19
Table 4. Patient pathway implementation levels in CCCNs – template adaptation criteria...	22
Table 5. Patient pathway implementation levels in CCCNs – pathway usage criteria.....	23
Table 6. Symbols used in the patient pathway models.....	26

List of Abbreviations

BPMN	Business Process Model and Notation
CCCN	Comprehensive Cancer Care Network
CRC	Colorectal Cancer
EU	European Union
iPAAC	Innovative Partnership for Action Against Cancer
PC	Pancreatic Cancer
QI	Quality Indicator
UML	Unified Modelling Language
WP10	Work Package 10

1 Background

Health care systems face a broad spectrum of transition processes that necessitate comprehensive, integrated care delivery. In this context, demographic change, skilled worker shortage and an increasing number of patients with multimorbidity and chronic diseases are among the main drivers (Hujala et al., 2016; Mirella M.N. Minkman, 2012). For the latter, cancer is one of the most common and costly diseases in western countries (Banks et al., 2010; Busse et al., 2010). In order to coordinate cancer care on the national level and to increase access to quality cancer care, the implementation of Comprehensive Cancer Care Networks (CCCNs) is recommended by the European guide on quality improvement in comprehensive cancer control – the CanCon guide (Albreht et al., 2017). Such networks integrate different institutions and institutional units representing all relevant episodes for a patient’s cancer care journey, i.e. research, prevention, diagnosis, treatment, follow-up, rehabilitation and end-of-life care (Albreht et al., 2017). One of their tasks is the provision of practical support tools. In this context, comprehensive, integrated patient pathways are recognised as a valuable approach (Albreht et al., 2017). Whereas the term “patient pathway” is often used with regard to optimising cancer care processes and aligning information and communication flows, there are still central elements missing. These are

- a common terminological basis and understanding of patient pathways and
- methodical support for the development and implementation of patient pathways in CCCNs.

These gaps have negative impact on the governance of cancer care on national and on EU level as well as on the harmonisation and standardisation of patient pathway projects across CCCNs. To further advance the utilisation of patient pathways in cancer care on European and national levels, clarification of the concept and practical support for the implementation of patient pathways in CCCNs are necessary. To address these gaps, this iPAAC Patient Pathway Guide – the iPa²-Guide – includes an agreed definition of patient pathways and a description of the necessary steps for creating and implementing generic patient pathway templates to be used in CCCNs to harmonise patient-centred and evidence-based cancer care. The iPa²-Guide provides the necessary methodical support to comply with the recommendation of including and managing patient pathways as a building block of National Cancer Control Programmes. It aims at unifying and simplifying the patient pathway development and implementation process for CCCNs.

The results summarised in this iPa²-Guide stem from a series of scientific articles of the authors. This literature is the scientific foundation for the developments and findings of all tasks on patient pathways within WP10 of the iPAAC Joint Action. Table 1 provides a

comprehensive overview of the publications. A summary is also to be found online at the iPAAC website¹.

Table 1. Scientific foundation of the iPa²-Guide

Title	Reference	Short description
Understanding Patient Pathways in the Context of Integrated Health Care Services – Implications from a Scoping Review	(Richter and Schlieter, 2019)	With a systematic scoping review, typical themes in the literature and key characteristics of patient pathways distinguishing them from other pathway approaches were identified.
Validating the Concept of Patient Pathways: A European Survey on Their Characteristics, Definition and State of Practice	(Richter et al., 2021)	A survey among WP10 members provides insights into the current practice, expectations, and understanding of patient pathways. An agreed upon definition is presented.
Paving the Way for Patient Pathways: Synthesizing a User-Centered Method Design with Results from a Systematic Literature Review	(Richter and Schlieter, 2020)	Based on a systematic literature review and user stories collected, a development framework for patient pathways is provided.
Patient Pathways for Comprehensive Care Networks – A Development Method and Lessons from its Application in Oncology Care	(Richter and Schlieter, 2021)	A development method for patient pathway templates is presented, including a role model and procedural steps. The method is demonstrated with the colorectal cancer use case.

In section 2 of this guide, the terminological and methodical foundations of patient pathways in CCCNs are described. In section 3, the development of generic patient pathway templates for harmonising and standardising care in CCCNs is addressed. The adaptation and implementation of such patient pathway templates to the specifics of a particular CCCN is described in section 4. The results of the application of the iPa²-Guide’s methodical steps are shown in section 5 with the example use cases of colorectal and pancreatic cancer patient pathway templates, which were developed by the iPAAC patient pathway working group of WP10. This section also includes an outline of a patient pathway repository and modelling tool as well as lessons learned derived from the implementation of the patient pathway templates in the two pilot sites in Poland and Germany.

¹ URL: <https://www.ipaac.eu/news-detail/en/59-patient-pathways-for-comprehensive-cancer-care-networks/> (last accessed: 19.10.2021)

2 Patient Pathways in Comprehensive Cancer Care Networks

2.1 Definition of Patient Pathways

Whereas the term patient pathway is often used with regard to optimising processes and aligning information and communication flows, a common terminological basis is not provided. Furthermore, a number of related pathway terms can be found in the literature. Among them are for example: care pathway, clinical pathway, patient journey, treatment pathway or care map. Based on a systematic scoping review, the following key characteristics of patient pathways were identified (Richter and Schlieter, 2019):

Patient pathways are...

- stating and aligning **functional, biological, and patient-related goals of care**,
- focusing on **patient group and individual patient planning and -management** for complex long-term conditions,
- describing and sequencing **key components of care** to guide care provision and the patient journey,
- comprising the whole route, a patient takes across inpatient and outpatient settings and therefore are **interorganisational** pathways,
- developed, implemented and used by a **multidisciplinary team** comprising professional and informal caregivers as well as patients themselves,
- **evidence-based** and also reflecting experts' experiences,
- typically used for patient navigation, information, documentation, monitoring and evaluation purposes.

Thus, patient pathways adapt and extend characteristics of other well-known pathway concepts such as care pathways or clinical pathways (De Bleser et al., 2006; Kinsman et al., 2010; Schrijvers et al., 2012). There are two main aspects of patient pathways, that clearly distinguish them from other pathway concepts (Richter and Schlieter, 2019).

- Patient pathways cover the whole journey of care in a network of care providers for a defined patient type and along the whole continuum of care.
- Patient pathways have a strong patient focus. This becomes apparent through an incorporation of the patients' perspective and by highlighting patient engagement and empowerment elements.

Using the findings from the literature, a definition was proposed to the participants of an online survey among the members of the iPAAC WP10 patient pathway working group (Richter et al., 2021). The proposed definition was broadly supported by 89% of the respondents. After incorporating the improvements suggested by the respondents, the following definition of patient pathways is recommended to be used in science and practice.

“A **patient pathway** is an evidence-based tool that supports the planning and management of the care process of individual patients within a group of similar patients with complex, long-term conditions. It details the phases of care, guiding the whole journey a patient takes by defining goals and milestones, and supports mutual decision-making by the patient and his/her multidisciplinary care team collaborating in a comprehensive network of care providers.” (Richter et al., 2021)

In the case of cancer care, the usage of patient pathways refers to CCCNs and to the whole care journey of cancer patients, i.e. prevention, diagnosis, treatment, follow-up, rehabilitation, end-of-life care and also including research (Albrecht et al., 2017). How patient pathways can be utilised for both standardisation and governance of cancer care in general as well as for the organisation of care practice in specific CCCNs is described in the following.

2.2 Patient Pathway Usage Scenarios

There are two major usage scenarios for patient pathways (see Figure 1). These are:

- Harmonisation and standardisation of cancer care in CCCNs by developing and providing generic patient pathway templates.
- Implementation and application of patient pathways in CCCN practice.

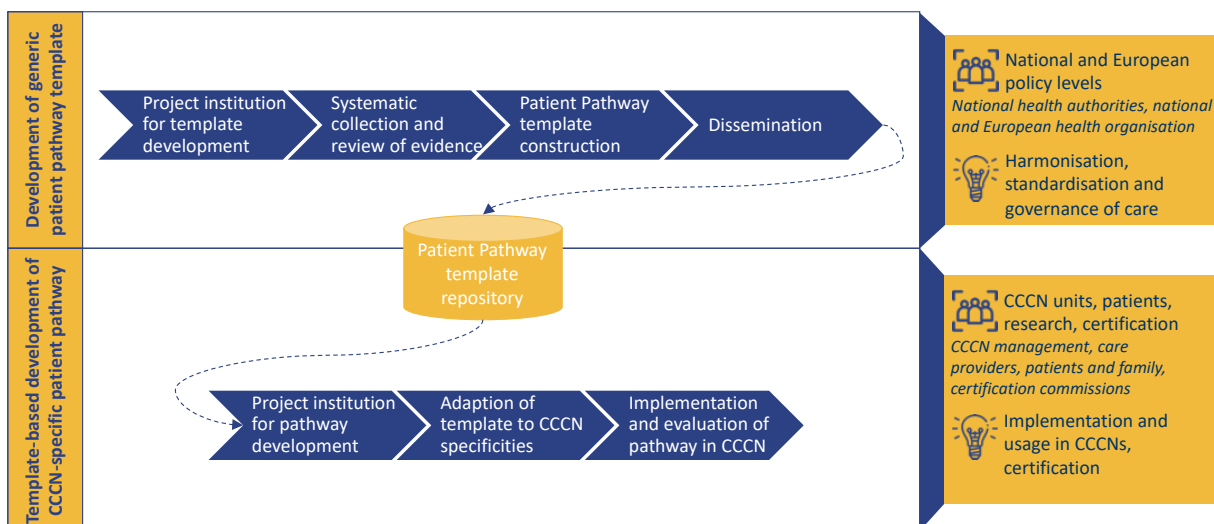


Figure 1. Usage scenarios of the template-based patient pathway approach²

SCENARIO 1 (upper part in Figure 1): As a basis, generic patient pathway templates will be developed, that function as evidence-based, agreed upon blueprints for patient pathways in CCCNs (Richter and Schlieter, 2021). Such generic patient pathways are developed for example by national health authorities, national, European or international health organisations with the purpose of standardising and harmonising care processes for specific patient types/

² Icons made by [Freepik](https://www.flaticon.com) from www.flaticon.com

tumour entities. Such patient pathway templates can help to translate the recommendations of national and international clinical practice guidelines into clinical practice – functioning as the interface and transmission medium between science and practice. Also, they function as a tool to support the implementation of the set of standards for CCCNs, since they map the recommendations on a process level.

SCENARIO 2 (lower part in Figure 1): These generic patient pathway templates are then used by CCCNs for the development of CCCN-specific patient pathways. In this case, the template functions as a guiding blueprint for pathway development and is adapted to national, regional, and local conditions. This adaption will result in slightly different patient pathways for different CCCNs.

The phases of the two patient pathway usage scenarios – the development of patient pathway templates and their implementation in CCCNs – are detailed in sections 3 and 4 of this guide.

2.3 Expected Benefits

The template-based patient pathway approach holds potentials for several positive effects on the pathway development and implementation processes as well as on care itself (e.g. shortened waiting times, increased patient satisfaction, shorter hospital stays). For the former – due to the reuse of pathway templates by several CCCNs – both effectiveness and efficiency is expected to increase (Kirchmer, 2009). Patient pathway templates could increase safety for patients and health service providers, reduce risks and costs during pathway development (e.g. by shortened development time), improve a systematic data collection and increase pathway quality. Such impacts are to be measured in future and benefits need to be shown to establish the development and implementation of patient pathway templates as standard for health care network governance in general and for CCCNs in particular. A preliminary study among iPAAC WP10 members on the expected impact of template-based patient pathway development gives first insights into added values expected. It concerns the following aspects:

- Improving the quality of care in CCCNs
- Creating a uniformly high level of quality care
- Shortening the development time for patient pathways in CCCNs
- Simplifying the development of patient pathways in CCCNs
- Improving evidence-based practice
- Increasing reusability of patient pathways
- Increasing the quality of patient pathways implemented in CCCNs
- Contributing to internal dissemination of relevant knowledge
- Increasing comprehension of the patient pathway care process

3 Harmonisation and Standardisation of CCCN Care Using Patient Pathway Templates

In the following, the four major phases of generic patient pathway template development are described. Each phases' objective, key activities and main results expected are outlined. Complex tasks are described in more detail.



3.1 Project Institution for Patient Pathway Template Development

Objective: to set up the patient pathway development project, define the project scope and the template development team.

Activity Checklist:

- Initiate project.
- Define general pathway scope and project aim.
- Establish multidisciplinary template development team.
- Train and educate team on development process.
- Set up project management plan.

A core activity of the project institution phase is the establishment of a multidisciplinary patient pathway template development team (working group) (Gordon, 1995; McLachlan et al., 2019; Vanhaecht et al., 2012; Wicke et al., 2004). This team shall consist of patient pathway template designer(s), patient pathway template stakeholders also comprising future patient pathway users, and method expert(s) (Richter and Schlieter, 2021). Their roles are described in Table 2.

Table 2. Roles and qualifications of patient pathway template development team members

	Role	Qualification
Patient pathway template designer	<ul style="list-style-type: none"> • Excerpts domain knowledge and transfers it to patient pathway template • Prepares patient pathway template for reuse 	Modelling expert: computer scientist, information systems engineer
Patient pathway template stakeholder	<ul style="list-style-type: none"> • Provide domain input for patient pathway template development • Review and approve patient pathway template 	Domain expert: representative of template interest groups (e.g. policy, patient organisations, health organisations), representatives of CCCN units covered by patient pathway template
Method expert	<ul style="list-style-type: none"> • Leads method application and conducts trainings • Continuous method optimisation 	Method expert: business economist, information systems engineer

The template development team should be trained and educated about the development process as described in this iPa²-Guide. The consensus finding process shall be defined and agreed upon within the team (Richter and Schlieter, 2020). The project management plan, e.g. timetables, tasks, responsibilities, and resources, should be set up (Gordon, 1995; Vanhaecht et al., 2012).

Main Results:

- ✓ Scope and boundaries of the patient pathway template project are defined.
- ✓ Project team is defined and members are educated on the patient pathway template development process.
- ✓ Project management plan is formulated.

3.2 Systematic Collection and Review of Evidence

Objective: to collect and evaluate current evidence and to assess the current state of patient pathway practice for the tumour entity addressed.

Activity Checklist:

- Systematic review of existing evidence for whole continuum of care.
- Systematic collection of existing pathways for the cancer addressed and of good practice examples.
- Analysis of care organisation (as is and to be) in CCCNs for the tumour entity addressed from the network/ network units and patient and family perspectives.
- Collection of quality and performance indicators.

The systematic collection and review of evidence should use literature reviews to analyse and assess the current state of existing evidence for the whole continuum of care covered by the patient pathway template intended (Richter and Schlieter, 2021). This should include reviewing existing (patient) pathways for the patient population addressed in both scientific and grey literature – including similar concepts such as care pathway, clinical pathway, or patient journey in the search as synonyms frequently used. For the organisational analysis, the perspectives described in (Vanhaecht et al., 2012) can be used. Furthermore, a search for existing quality indicators for the care of the cancer type addressed should be conducted and quality indicators to be used should be collected. For this purpose, the iPAAC Evaluation Tool for Quality Indicators in Oncology (iET-QIs) can be applied (Cocchiara et al., 2020a).

The collection of evidence is typically carried out by the patient pathway template stakeholders and methodologically supported by the method expert(s) of the template development team. The literature, documents and existing pathways collected function as inputs for the following template construction phase.

Main Results:

- ✓ Existing evidence and good practice examples (existing pathways or parts) are collected.
- ✓ The documents collected are reviewed and selected with regard to their usability and suitability for the own project purposes.
- ✓ A set of quality indicators to be integrated in the patient pathway template is defined.

3.3 Patient Pathway Template Construction

Objective: to design and approve a generic patient pathway template for the tumour entity addressed.

Activity Checklist:

- Select patient pathway template representation format.
- Draft patient pathway template.
- Review patient pathway template draft, consensus finding, refinement, approval.
- Document patient pathway template to guide its implementation and future updates.

The construction of a patient pathway template comprises six steps, with the steps 2 to 5 being performed in an iterative manner as depicted in Figure 2. They are described in the following and are published in (Richter and Schlieter, 2021).

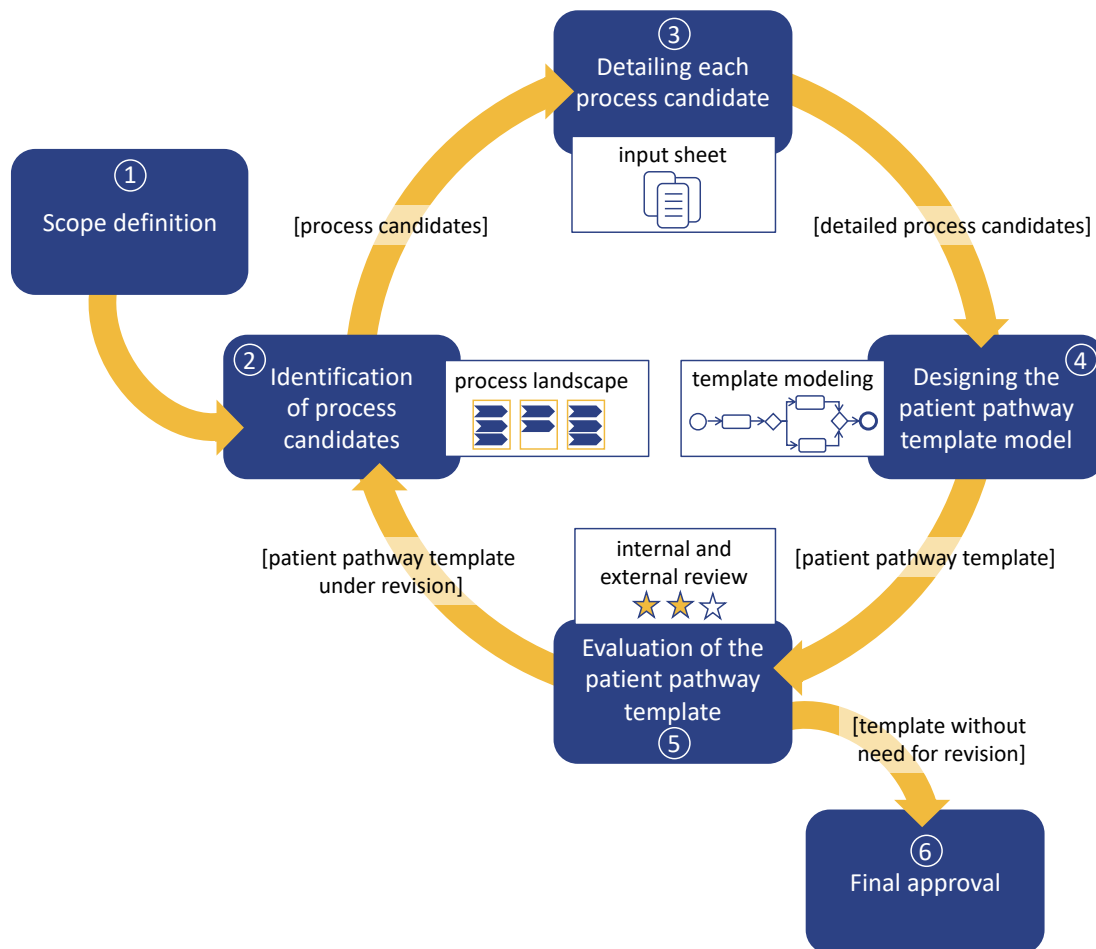


Figure 2. Process of the patient pathway template construction phase (Richter and Schlieter, 2021)

(1) SCOPE DEFINITION. This step includes the specification of all phases along the continuum of care, which are to be covered by the patient pathway template. These typically can be the CCCN entry, diagnosis, treatment planning, treatment, follow-up, rehabilitation, supportive care, end-of-life care, and end of network care. The patient population as well as in- and exclusion criteria for patients included in the patient pathway need to be defined. Furthermore, the modelling language and tool used for pathway representation need to be selected. The Business Process Model and Notation (BPMN) and the Unified Modeling Language (UML), especially activity and use case diagrams, are commonly used in health care practice (Mincarone et al., 2018). Domain-specific language extensions such as BPMN4CP, a BPMN extension for care pathway modelling (Braun et al., 2016), even provide pathway specific elements. Using this modelling language, the evidence level and evidence source as well as quality indicators can easily be represented and maintained in the pathway template model by the patient pathway template designer.

(2) IDENTIFICATION OF PROCESS CANDIDATES. The step comprises the identification of important patient pathway steps (process candidates) and linking them to the phases of care as defined during the scope definition. This results in the description of a process landscape. Therefore, the contents of existing pathways for the addressed patient population – identified with the previously conducted literature review – should be analysed and mapped to structure the patient pathway landscape. If there are none available, this step can be solely performed in workshops with the domain experts of the patient pathway template development team and by including the recommendations from medical guidelines.

(3) DETAILING EACH PROCESS CANDIDATE OF THE PROCESS LANDSCAPE. For this step, a standardised input sheet is provided. It roots in the information collected for care pathway building as described with the 3-blackboard method by (Vanhaecht et al., 2011) and additionally includes perspectives to be covered in order to meet the patient pathway specific characteristics (see section 2.1). The sheets should be filled in by the domain experts of the template development team using their own experiences and the results of the systematic collection and review of evidence (see section 3.2). To reduce the risk of distortion of included studies, the level of evidence must be paid attention to (OCEBM Levels of Evidence Working Group, 2011). The input sheet is filled for each process candidate and requires the following information:

- Title:** name of process candidate.
- Patient inclusion criteria:** e.g. a subgroup of the patient population addressed.
- Responsibilities:** Responsible units of a CCCN.
- Resources:** e.g. medical technology, infrastructures.
- Inputs:** e.g. information, lab results, documents.
- Process description:** interventions, decisions, consultations, CCCN units interfaces, tasks related to medical, nursing, and supportive care (i.e. psychological, physical, emotional, practical/ organizational, informational, spiritual, social support (Fitch, 2008)), as well as to administration and activities the patient him-/herself is responsible for.
- Timings:** timer events, time criticalities, time recommendations, iterations.

- Outputs:** e.g. information, lab results, documents.
- Measures:** quality indicators and other evaluation measures/ performance indicators.
- Adaptation notes:** required and optional steps in the patient pathway template; national, regional, local conditions to be considered for the implementation in a CCCN.
- References:** of the scientific evidence and other documents used for patient pathway template creation.

(4) DESIGNING THE PATIENT PATHWAY TEMPLATE MODEL. The patient pathway template designer uses the information from the input sheets to designing the patient pathway template model. Therefore, the process landscape view is detailed by specifying the process candidates, their order and relations. This step can be supported by also including methods for the derivation of pathways from medical guideline recommendations as for example described in (Schlieter et al., 2012). The template designer might identify information gaps, which need to be closed by getting feedback from the involved domain experts either on short notice or during the following evaluation of the patient pathway template.

(5) EVALUATION OF THE PATIENT PATHWAY TEMPLATE. With this step, feedback from the members of the development team is collected and needs for template improvements are identified. The template should also be reviewed by external domain experts not involved in the development process. These could for example be who were not involved in the pathway development. For examples, such experts could be medical guideline developers, representatives from quality and safety committees, health economists, attorneys or representatives of patient organisations.

(6) FINAL APPROVAL. As long as there is need for revision of the patient pathway template, the steps (2) to (5) are performed in development cycles, detailing the template with each iteration. When the template is evaluated with no need for further revisions, it gets final approval from the members of the development team and external reviewers.

Main Results:

- ✓ Internally and externally approved patient pathway template.
- ✓ Documentation of patient pathway template and its development process.

3.4 Template Dissemination and Evaluation

Objective: to prepare the implementation and evaluation of the approved patient pathway template.

Activity Checklist:

- Define messaging and dissemination strategy.
- Define evaluation strategy.
- Pilot, evaluate and (if necessary) revise the patient pathway template in CCCNs.
- Document piloting results and patient pathway template revisions.
- Deploy or use an existing patient pathway repository or other channels to provide and disseminate the approved patient pathway template to CCCNs.

The approved patient pathway template should be disseminated and published, i.e. made available to the CCCNs of interest. Therefore, a messaging and dissemination strategy should be developed and implemented (Flores et al., 2018; Gordon, 1995; Wicke et al., 2004). With this regard, a common patient pathway template repository, provided and managed by a governing agency of the CCCNs addressed or by an international health care society, would be beneficial (Richter and Schlieter, 2021, 2020).

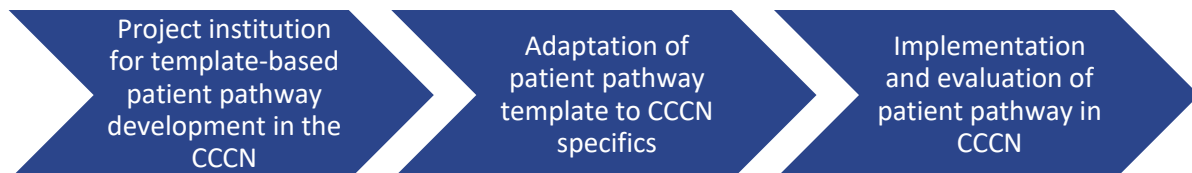
The approved patient pathway template should further be tested by piloting it in selected CCCNs. Therefore, the template should be implemented at the CCCNs as described in section 4 of this guide. A template evaluation strategy should be defined and the template should be revised according to the piloting results and lessons learned. Revisions should be incorporated and explained in a comprehensible manner. The piloting documentation should be published in addition to the (revised) patient pathway template.

Main Results:

- ✓ Dissemination strategy defined and patient pathway template provided to CCCNs.
- ✓ Evaluation strategy defined and applied with pilot testing of the patient pathway template in cooperating CCCNs.
- ✓ Revision of the patient pathway template according to piloting results.

4 Implementation and Usage of Patient Pathways in CCCNs

In the following, the three major phases of template-based development of CCCN-specific patient pathways are described individually.



4.1 Project Institution for Template-Based Patient Pathway Development in CCCNs

Objective: to set up the patient pathway project and development team at the CCCN and reflect on own current care practice.

Activity Checklist:

- Initiate patient pathway development project at CCCN.
- Define and instruct multidisciplinary development team.
- Time planning for the implementation.

When a CCCN decides to develop a patient pathway based on an approved patient pathway template, it first needs to establish a project for pathway development. A multidisciplinary project team should involve the patient pathway users of the CCCN, patient pathway designer(s), and development method expert(s). Their roles are described in Table 3.

Table 3. Roles and qualifications of CCCN patient pathway development team members

	Role	Qualification
Patient pathway designer	<ul style="list-style-type: none"> • Adapts the patient pathway template to CCCN specifics and designs the patient pathway model • Ensures the correct template usage 	Modelling expert: computer scientist, information systems engineer
Patient pathway user	<ul style="list-style-type: none"> • Supports with template adaptation • Reviews and approves patient pathway for the CCCN • Uses and implements the patient pathway in the CCCN 	Domain expert: representative of involved CCCN units covered by the patient pathway
Method expert	<ul style="list-style-type: none"> • Leads method application, conducts trainings • Continuous method optimisation 	Method expert: business economist, information systems engineer

Main Results:

- ✓ Defined project scope and plan.
- ✓ Defined and instructed patient pathway development team.

4.2 Adaptation of Patient Pathway Template to CCCN Specifics

Objective: to design and approve a CCCN-specific patient pathway based on the selected patient pathway template.

Activity Checklist:

- Drafting an adaptation of the patient pathway template to national, regional and local conditions.
- Reviewing patient pathway draft, consensus finding, refinement, approval.
- Documentation of experience with the template adaptation process.

The task of the patient pathway development team is the adaptation of the template to the context of the CCCN, i.e. to national, regional, and local specificities which are not part of the evidence base used for pathway template development (e.g. medical guidelines). Therefore, the adaptation notes specified as part of the patient pathway template should be used. For example, reasons for adaptation could be national disease management programs or follow-up plans defining timeframes of a follow-up routine. The pathway also needs to be adapted in case of unavailable technologies or care professionals (e.g. the existence and role of nurse specialists might differ between countries) (Richter and Schlieter, 2021).

Main Results:

- ✓ Adapted and approved patient pathway model for the CCCN.
- ✓ Documentation of the adaptation process and of the patient pathway model.

4.3 Implementation and Evaluation of Patient Pathway in CCCN

Objective: to test and implement patient pathway in the CCCN and evaluate its impacts and usability.

Activity Checklist:

- Set up implementation plan incl. strategy for continuous patient pathway evaluation and follow-up.
- Inform and train patient pathway users in the CCCN units.
- Pilot and review patient pathway in CCCN on limited group of patients.
- Post-pilot refinement of patient pathway and final approval.

After its development, the patient pathway needs to be piloted in the CCCN, implemented and continuously evaluated, e.g. it has to be checked if new evidence or an update of the patient pathway template are available and whether such changes impact the CCCN's patient pathway contents (Richter and Schlieter, 2020). The users of the patient pathway in all CCCN units have to be informed and trained on the topics of patient pathway usage – e.g. how to integrate the patient pathway in their daily business, what differs from the former ways of working, and how to handle deviations from the patient pathway.

For the definition of the implementation plan, several aspects – which define the depth of patient pathway implementation in the CCCN - have to be considered and decided. They are split into implementation criteria concerning template adaptation (see Table 4) and patient pathway usage in the CCCN (see Table 5). For each criterion, three different implementation levels are described (low, medium, high). The implementation criteria and levels should function as framework for the definition of the implementation plan for the CCCN. In the following tables, the minimum requirement for each patient pathway implementation criterion according to the iPAAC WP10 agreement is highlighted in bold.

Table 4. Patient pathway implementation levels in CCCNs – template adaptation criteria

Template adaptation related implementation criteria		
DESIGN APPROACH. The degree in which a structured approach is used and different stakeholders were involved during the pathway design.		
[Low] No specified, structured approach is used and there is no involvement of different stakeholders in the design process.	[Medium] A structured approach is used and/or different stakeholders are involved in the design process.	[High] The adaptation and pathway design is conducted using the iPa²-Guide.
ADAPTATION TO CONTEXT. The degree to which the patient pathway template is adapted to local, regional, national contexts (laws regulations, guidelines).		
[Low] The default version of the patient pathway is used, i.e. there is no explicit adaptation to local, regional, national specifics.	[Medium] The patient pathway template is adapted to local, regional, national specifics but there is no explicit traceability to the origins for this adaptation (laws, regulations, guidelines).	[High] The patient pathway template is adapted to local, regional, national specifics. There is explicit traceability between pathway contents and their origin in laws, regulations, guidelines. Changes in these origins are continuously reflected in the corresponding pathway structures.
DOCUMENTATION OF LESSONS LEARNED. The degree to which the template adaptation process is documented with lessons learned.		
[Low] The adaptation process is not being reflected and lessons learned are not documented or communicated.	[Medium] The adaptation process is being reflected and lessons learned are documented and communicated.	[High] The adaptation process is being reflected and lessons learned are documented and communicated. There is a continuous experience exchange with other CCCNs regarding template adaptation.
DIGITALISATION. The degree to which the patient pathway is digitally supported.		
[Low] The patient pathway is provided as printed paper version or pdf file to the involved CCCN units.	[Medium] The legacy IT systems of the involved CCCN units support the pathway.	[High] There is a fully integrated CCCN IT system representing the whole patient pathway and supporting communication between the involved CCCN units.

Table 5. Patient pathway implementation levels in CCCNs – pathway usage criteria

Patient pathway usage related implementation criteria		
PATHWAY OWNER. The extent to which the pathway ownership approach is effective in improving the pathway performance.		
[Low] There is a pathway owner (individual or a group) informally charged with improving the performance of the pathway.	[Medium] There is an official pathway owner role (an individual or a group) in charge with improving the performance of the pathway.	[High] The official pathway owner has high degree of creditability and close relation with the CCCN units' senior decision-making bodies in terms of changing the process (continuous improvement).
PATHWAY USER AWARENESS. The degree in which a patient pathway user (performer) is aware of his/her task as described in the patient pathway and in which he/she is contributing to the improvement of the pathway as a whole.		
[Low] Performers are aware of their function/tasks as described in the patient pathway and perform it correctly. Their primary focus is on their own function/tasks without any explicit emphasis on pathway improvement.	[Medium] Performers are aware of their tasks/functions as described in the patient pathway and of the patient pathway as a whole. They recognise and propose possible improvements in the pathway.	[High] Performers know and perform their function/tasks as described in the patient pathway and continuously look for signs that the pathway process should change, and they propose improvements.
NETWORK OF PATHWAYS. The degree in which a patient pathway is part of a network of system components (e.g. through shared IT support, experienced improvements, shared resources).		
[Low] An explicit definition of patient pathways exists for several tumour entities.	[Medium] A network of patient pathways is designed, through integrated systems of the CCCN units.	[High] Synergy is established within a network of patient pathways through integrated systems and communication channels used by the CCCN units.
STAKEHOLDER INVOLVEMENT FOR CONTINUOUS PATHWAY IMPROVEMENT. The degree in which the owner and the stakeholders of the patient pathway (explicitly including patients) communicate and indicate improvements of the pathway (intern and extern).		
[Low] There is no explicit focus and process on the improvement of the patient pathway.	[Medium] Stakeholders can mention and communicate points of improvement to the pathway owner.	[High] The pathway owner regularly improves the patient pathway based on the points of improvement

		from the stakeholders and communicates the changes to the stakeholders.
METRICS DEFINITION. The degree to which performance metrics and quality indicators are uniformly defined in the patient pathway.		
[Low] There are no or only basic metrics defined in the patient pathway.	[Medium] The default quality indicators defined in the patient pathway template are used.	[High] The default set of quality indicators is extended and aligned with additional metrics of the CCCN units and implemented.
MONITORING AND AVAILABILITY OF PATHWAY PERFORMANCE INFORMATION. The degree to which metrics defined are collected in a structured way and results are available to patient pathway stakeholders.		
[Low] Patient pathway process and quality data are collected in an unstructured way but results are periodically provided to pathway stakeholders.	[Medium] Patient pathway process and quality data are collected in a structured way and results are periodically provided to pathway stakeholders.	[High] Patient pathway process and quality data are collected in a structured way to analyse metrics. The results are always available to patient pathway users (real-time).
FLEXIBILITY. The degree to which deviations of pathway users from the patient pathway are tracked (documented).		
[Low] Deviations are not tracked.	[Medium] Deviations are tracked.	[High] Deviations are tracked and analysed.
EXTERNAL OBJECTIVITY. The degree in which the patient pathway is externally reviewed and audited (against laws, regulations, guidelines, etc.).		
[Low] The patient pathway is audited internally.	[Medium] The pathway is audited internally and externally.	[High] There is an established governance body and the patient pathway is audited internally and externally on predefined periods.

Main Results:

- ✓ Defined and applied patient pathway implementation and evaluation plan.
- ✓ Piloted, refined and finally approved patient pathway for CCCN.
- ✓ Patient pathway in daily use.

5 Example Use Cases

5.1 Background

The methodical steps described in the iPa²-Guide were applied to develop two patient pathway templates for the example tumour entities of colorectal cancer (CRC) and pancreatic cancer (PC). The patient pathway templates developed were implemented at the Lower Silesian Oncology Center (LSOC) in Poland and at the Charité Berlin in Germany. Therefore, they were adapted to the national, regional and local conditions. The degree of implementation can vary significantly, depending on the CCCN's commitment regarding organisation and technical implementation of patient pathways, digitalisation or data collection for pathway monitoring processes (see section 4.3). In cases of the pilots, the degree of implementation ranged from the integration of the templates into the CCCN's document management system to fine granular adaptation of the pathway process according to national, regional and local conditions.

5.1.1 Relation to other iPAAC Results

The CRC and PC patient pathway templates translate the recommendations from the Standard for Colorectal and Pancreatic Cancer Care Networks³ to a processual view. They also includes the quality indicators for colorectal cancer and pancreatic cancer to monitor and improve oncological care within CCCNs (Cocchiara et al., 2020b).



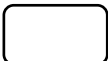
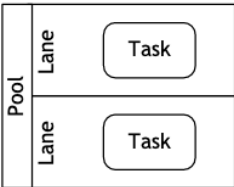




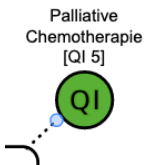
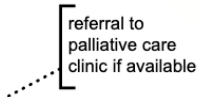
5.1.2 Representation of Patient Pathways

The CRC and PC patient pathway templates for CCCNs were developed in an iPAAC patient pathway repository comprising a healthcare-specific pathway modelling tool based on BPMN as described in section 5.4 of this guide. The elements⁴ used are described in Table 6.

³ URL: <https://www.ipaac.eu/res/file/outputs/wp10/cccn-standard-colorectal-pancreatic-cancer.pdf> (last accessed: 19.10.2021)

⁴ A full description of BPMN symbols and meanings can be found at http://www.bpmb.de/images/BPMN2_0_Poster_EN.pdf (last accessed: 19.10.2021)

Table 6. Symbols used in the patient pathway models

Symbol	Meaning
	Starting Event at the beginning of a (sub-)process (patient pathway).
	Ending Event at the end of a (sub-)process (patient pathway).
	Task (a unit of work) in the patient pathway. Can be represented as an expanded sub-process (with its own start and end event in the sub-pathway).
	Pools (participants along the pathway) and Lanes represent responsibilities for activities in the pathway. They can represent an organization, a role, or a system.
	Exclusive Gateway , for which, depending on the condition, exactly one edge is activated in the case of a branch or which waits for an edge in the case of a merge in order to activate the outgoing path flow.
	Parallel Gateway , for which all outgoing branches are activated simultaneously or which waits for all incoming branches to complete before triggering the outgoing flow when merging parallel branches.
	Inclusive Gateway , for which, depending on the condition, one or more outgoing edges are activated or, in the case of a merge, incoming edges are synchronised.
	Data Object representing information flowing through the pathway, such as documents (e.g. guidelines, questionnaires, reports, minutes), e-mails, letters, or datasets.
	Quality Indicator annotated at the corresponding place (task, decision, condition) in the patient pathway (green: certification relevant, yellow: additional iPAAC quality indicator).
	Annotation as a comment on another element, e.g. on a decision, a task, a document. Often describe adaptation notes for CCCNs.

5.2 Colorectal Cancer Patient Pathway Template

In the following, the results of utilising the iPa²-Guide for the development of a generic patient pathway template for colorectal cancer care in CCCNs are shown. First, a process landscape view on the CRC patient pathway template is given. Second, the relations and sequence of the identified phases in the landscape view are described in a detailed patient pathway model.

To develop an overview of the CRC patient pathway template, the working group started out with defining the general and most relevant sub-processes using a process landscape as depicted in Figure 3. It gives an overview of the stages of care (blue boxes) and the corresponding sub-processes/ phases (grey arrows). The process landscape does not represent sequential relationships between the sub-processes but is the top-level view of the CRC patient pathway. It gives a graphical overview and functions as the basis for a more detailed design of the CRC patient pathway template.

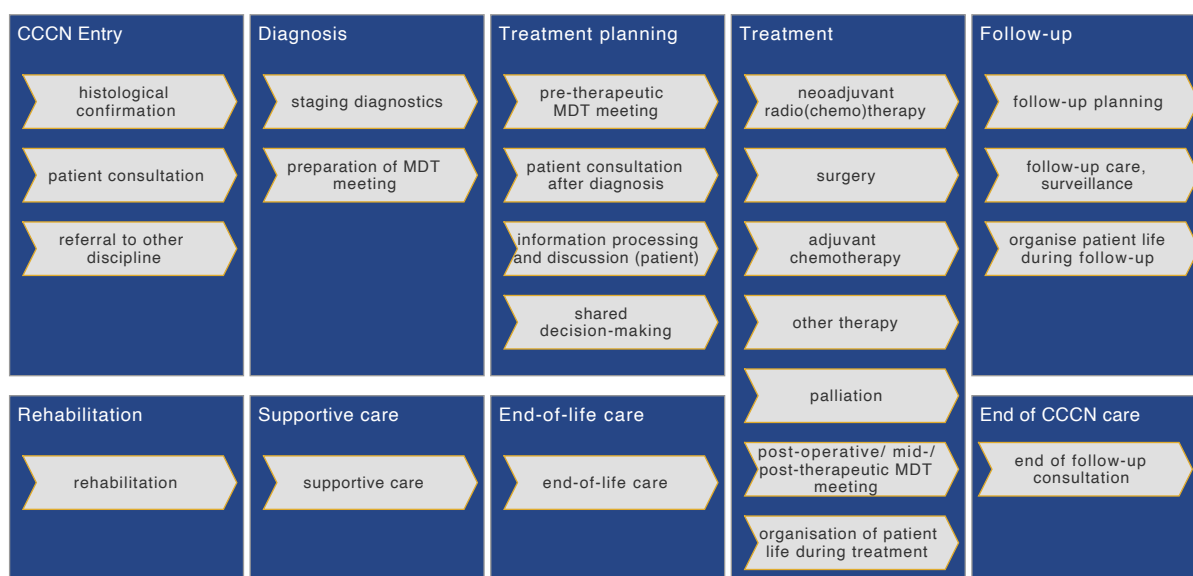


Figure 3. Process landscape view on the CRC patient pathway template

Based on the results of the phase descriptions provided by the experts of the WP10 patient pathway working group and complemented by the literature, the relations and sequences of the sub-processes described in the landscape view were defined. The resulting CRC patient pathway template is depicted in Figure 4. For the purpose of better readability, it is split into four parts, which are represented in Figure 5 (parts CCCN entry and diagnosis), Figure 6 (part treatment planning), Figure 7 (part treatment/ end-of-life care), and Figure 8 (parts follow-up and end of CCCN care). The detailed sub-processes for “patient consultation” and “patient consultation after diagnosis” are depicted in Figure 9 and Figure 10.

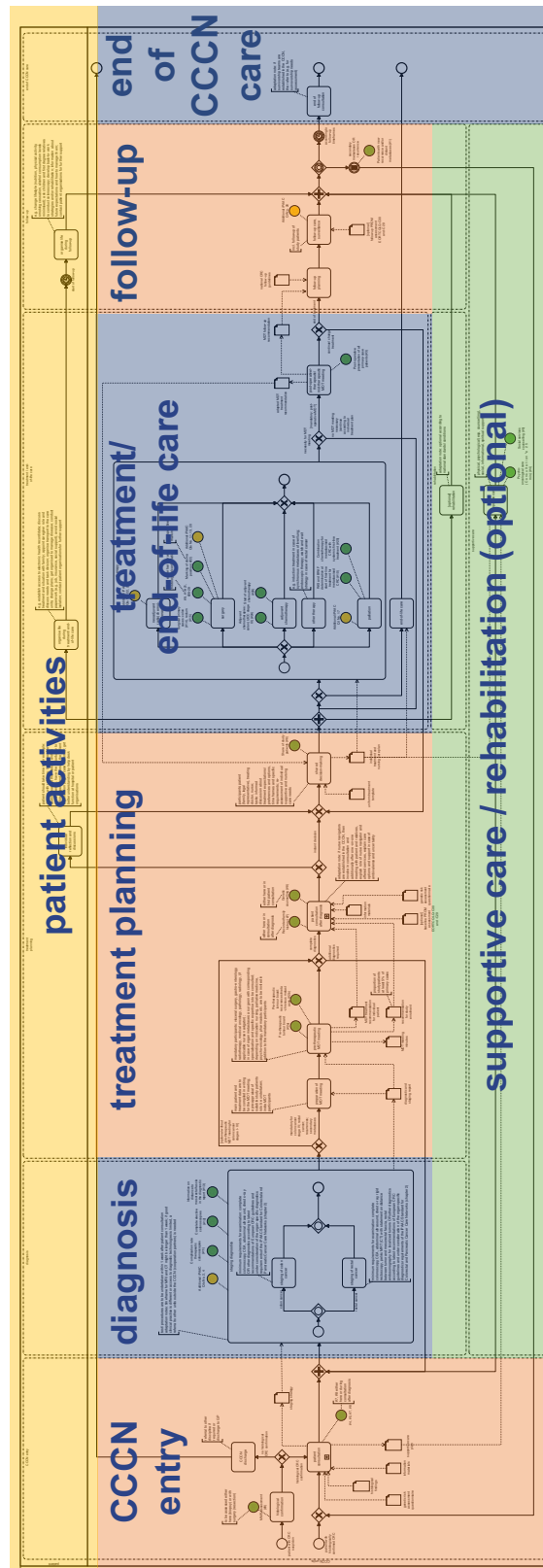


Figure 4. Overall structure of the colorectal cancer patient pathway template

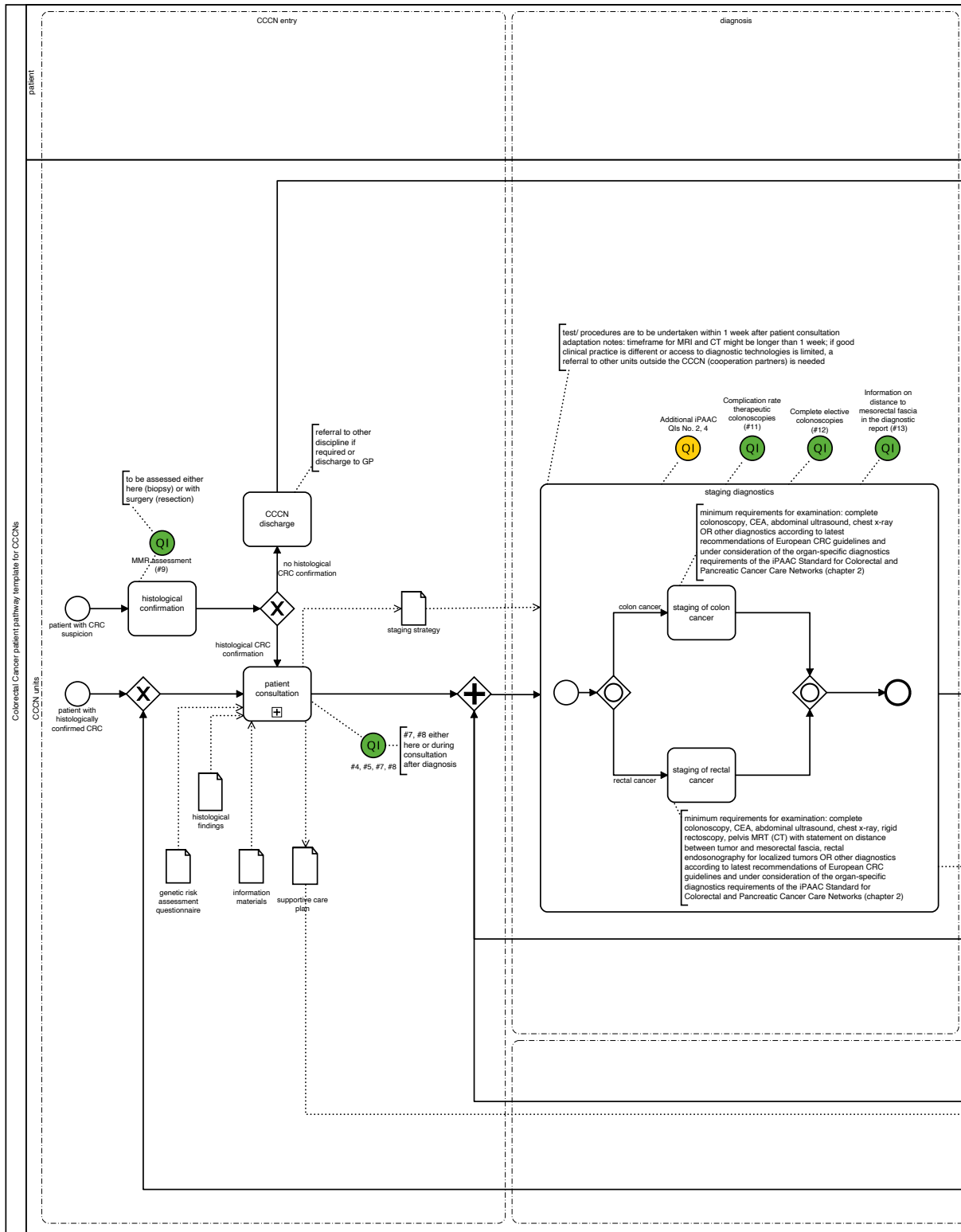


Figure 5. CRC patient pathway template - parts "CCCN entry" and "diagnosis"

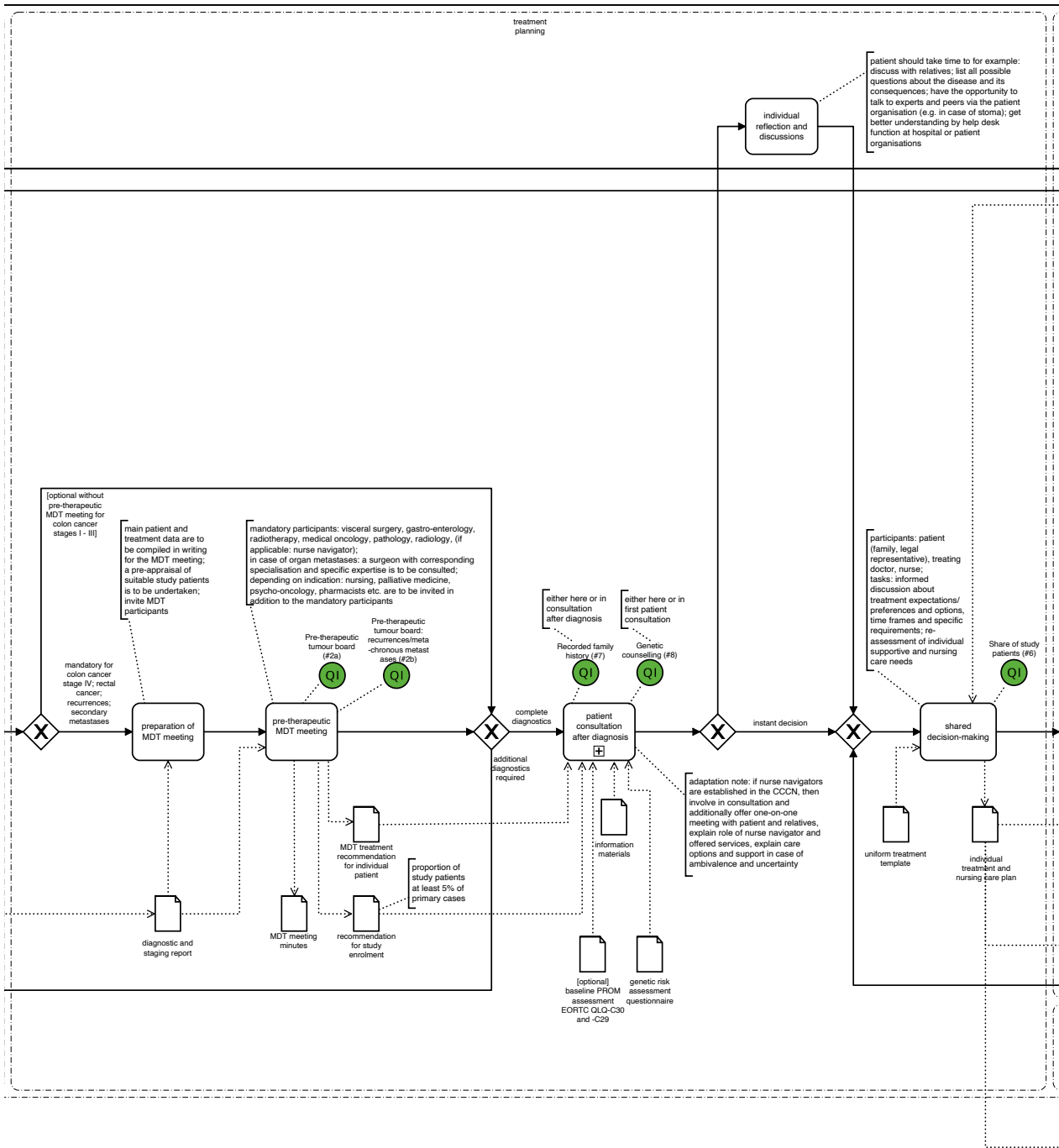


Figure 6. CRC patient pathway template – part “treatment planning”

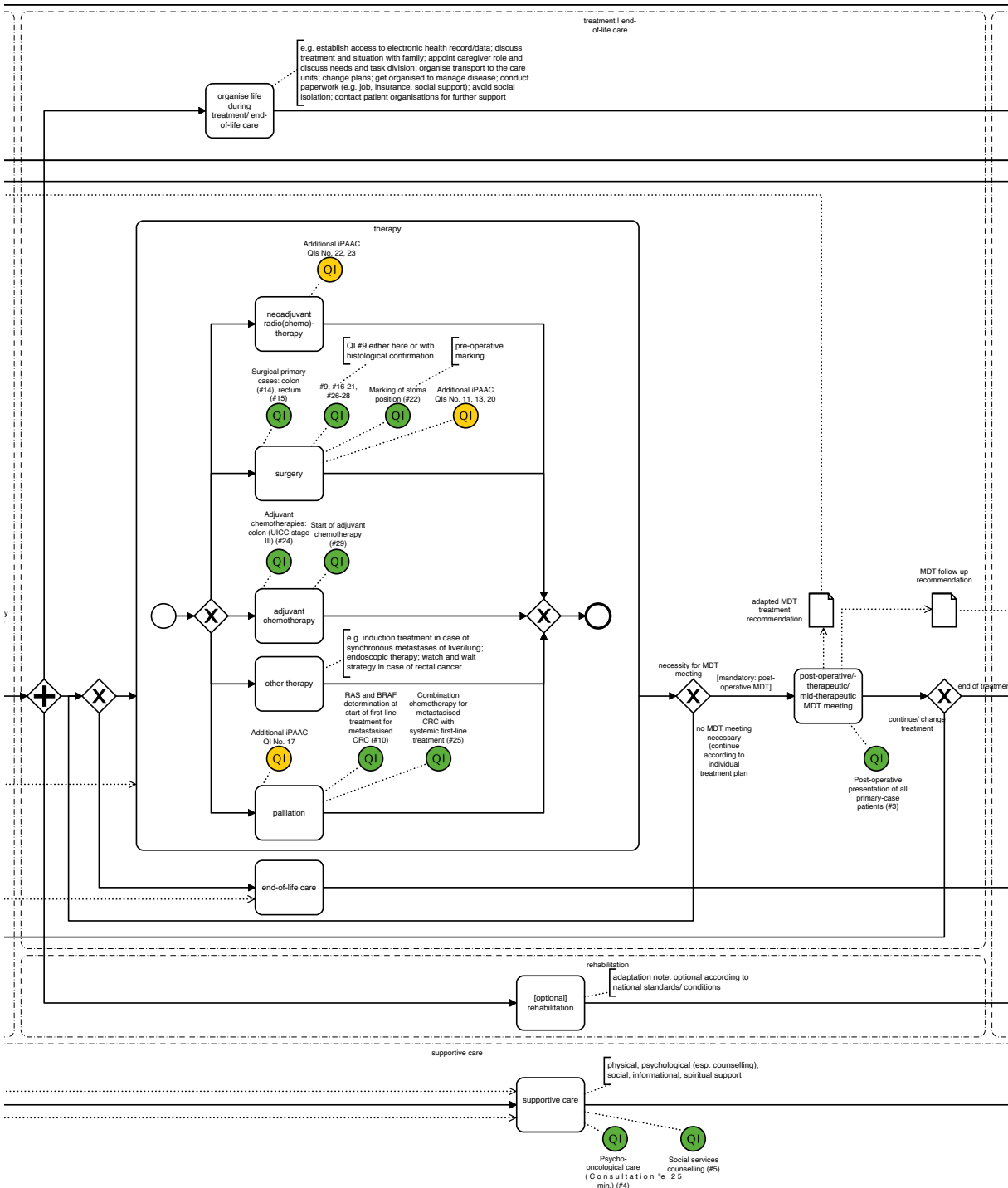


Figure 7. CRC patient pathway template – part “treatment / end-of-life care”

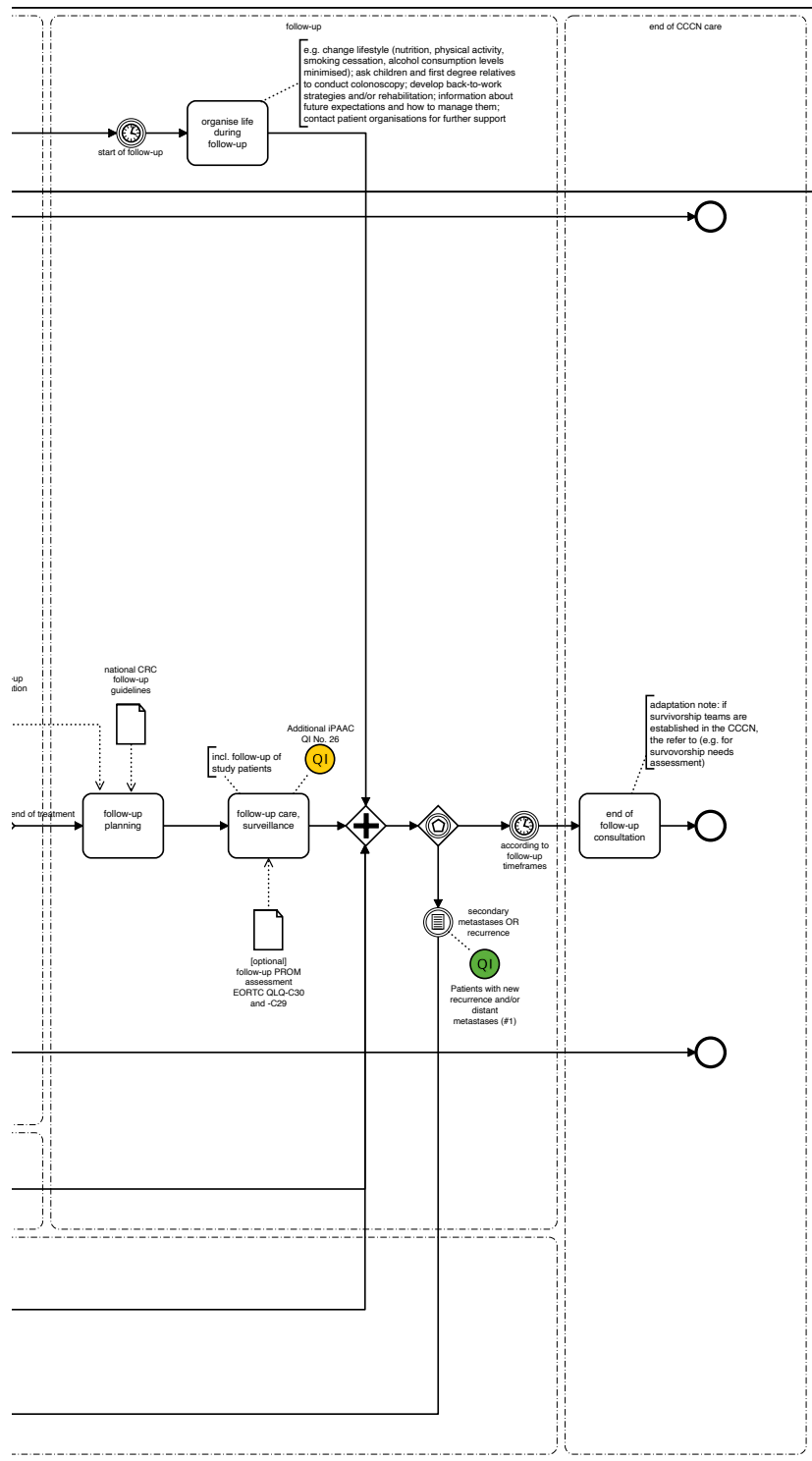


Figure 8. CRC patient pathway template – parts “follow-up” and “end of CCCN care”

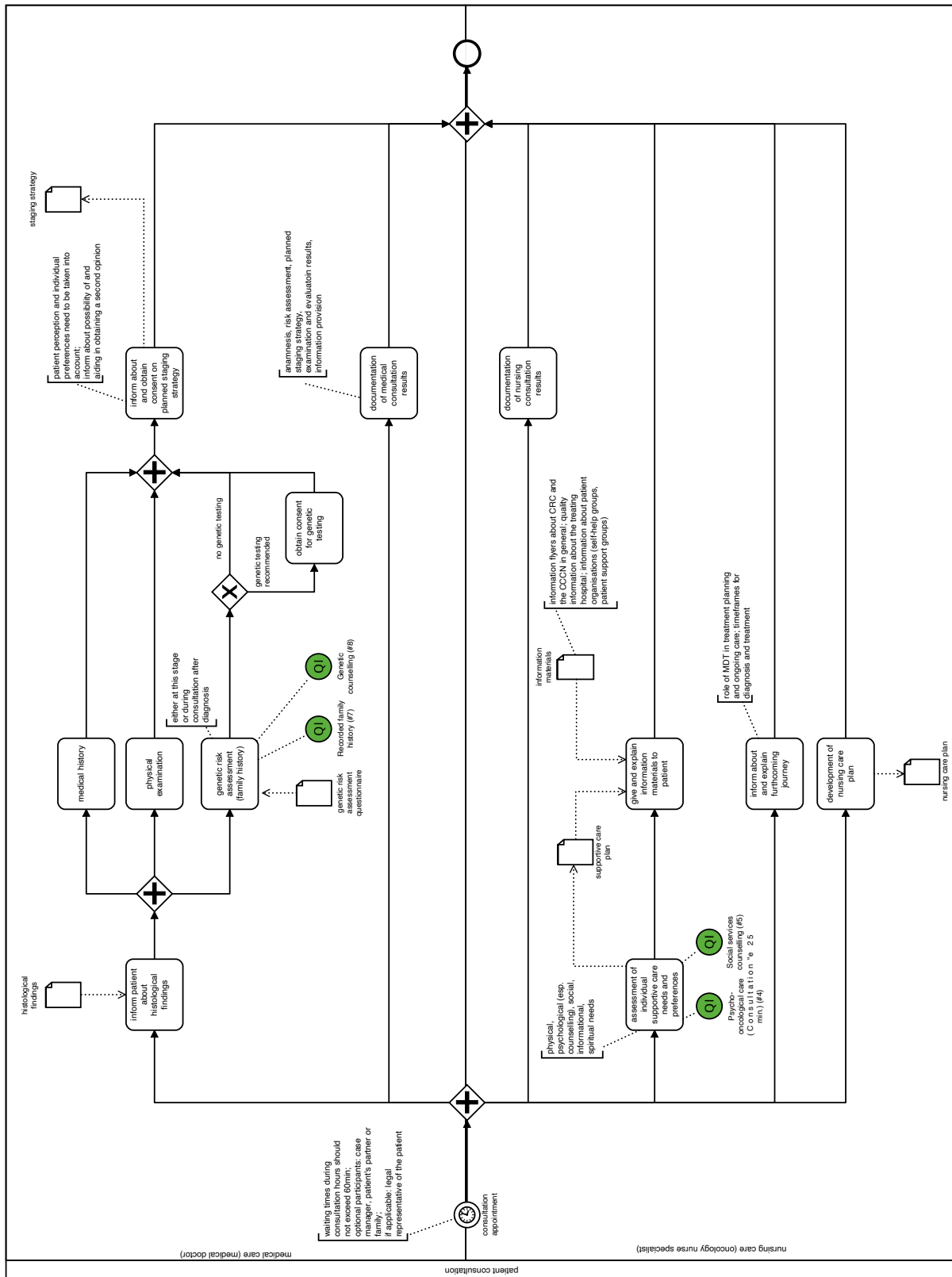


Figure 9. CRC patient pathway template – detailed view of the sub-process “patient consultation”

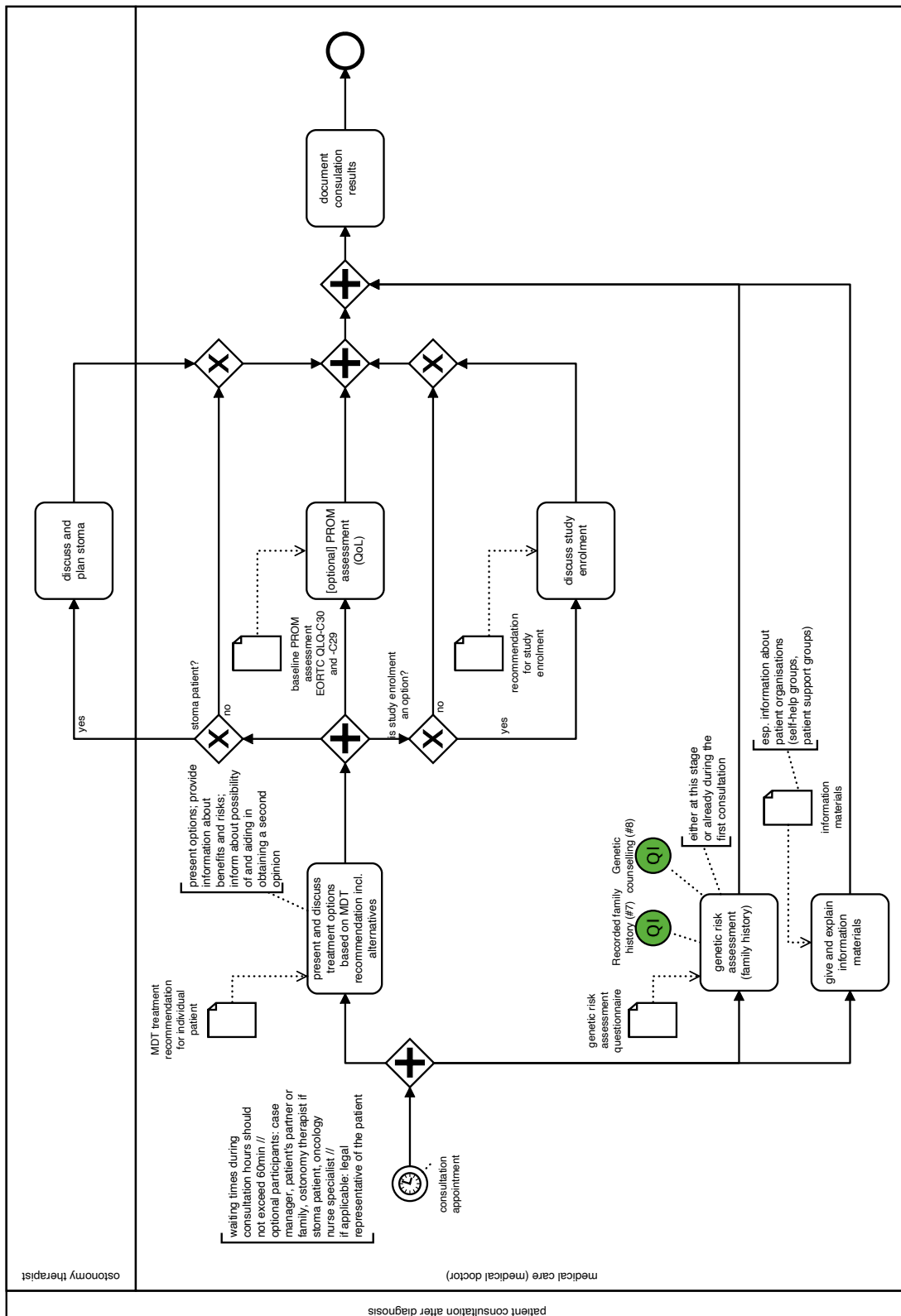


Figure 10. CRC patient pathway template – detailed view of the sub-process “patient consultation after diagnosis”

5.3 Pancreatic Cancer Patient Pathway Template

In the following, the results of utilising the iPa²-Guide for the development of a generic patient pathway template for pancreatic cancer care in CCCNs are shown. The overall structure of the PC patient pathway template is given in Figure 11. For better readability, it is split into four parts, detailing the template in Figure 12 (parts CCCN entry and diagnosis), Figure 13 (part treatment planning), Figure 14 (part treatment/ palliative care/ end-of-life care), and Figure 15 (parts follow-up and end of CCCN care).

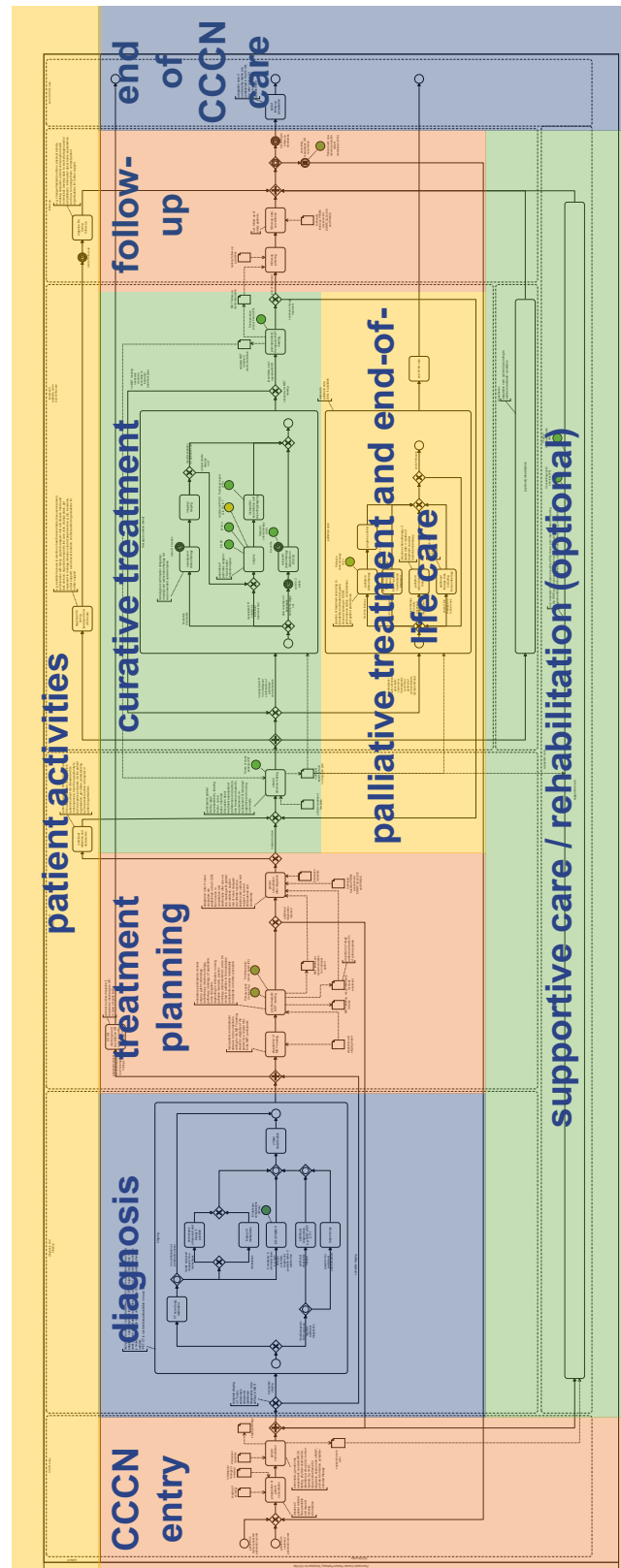


Figure 11. Overall structure of the pancreatic cancer patient pathway template

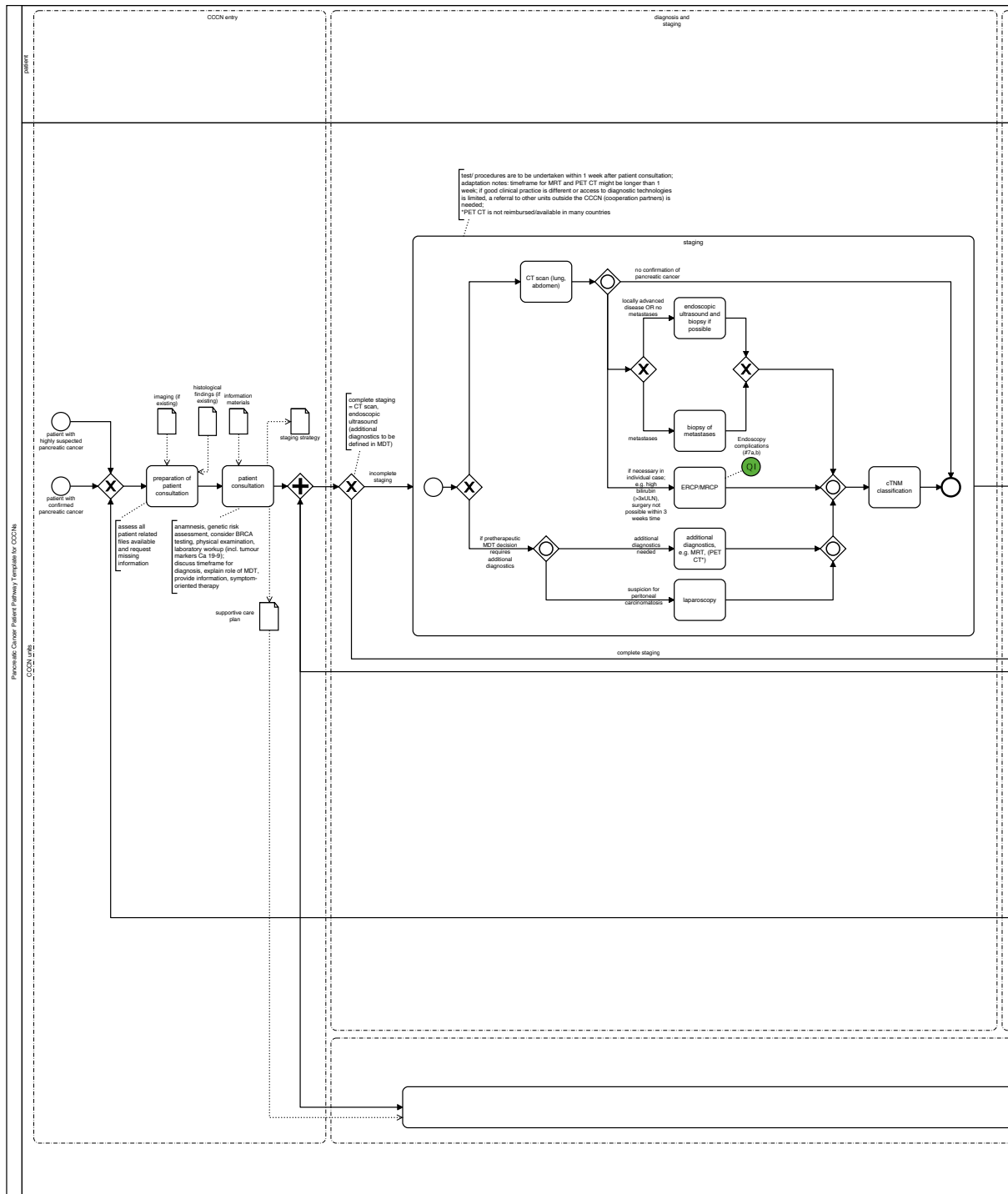


Figure 12. PC patient pathway - parts "CCCN entry" and "diagnosis"

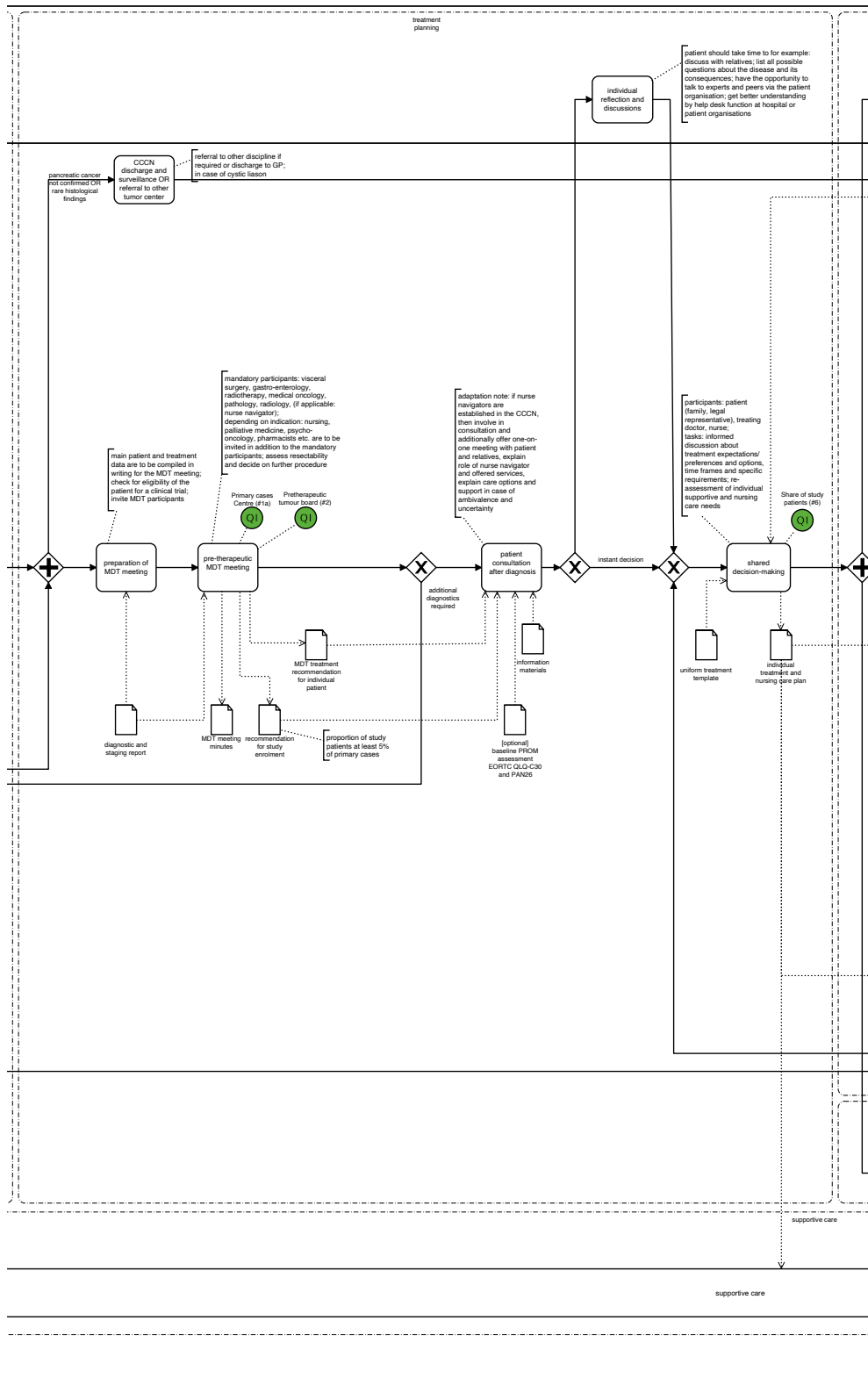


Figure 13. PC patient pathway - part "treatment planning"

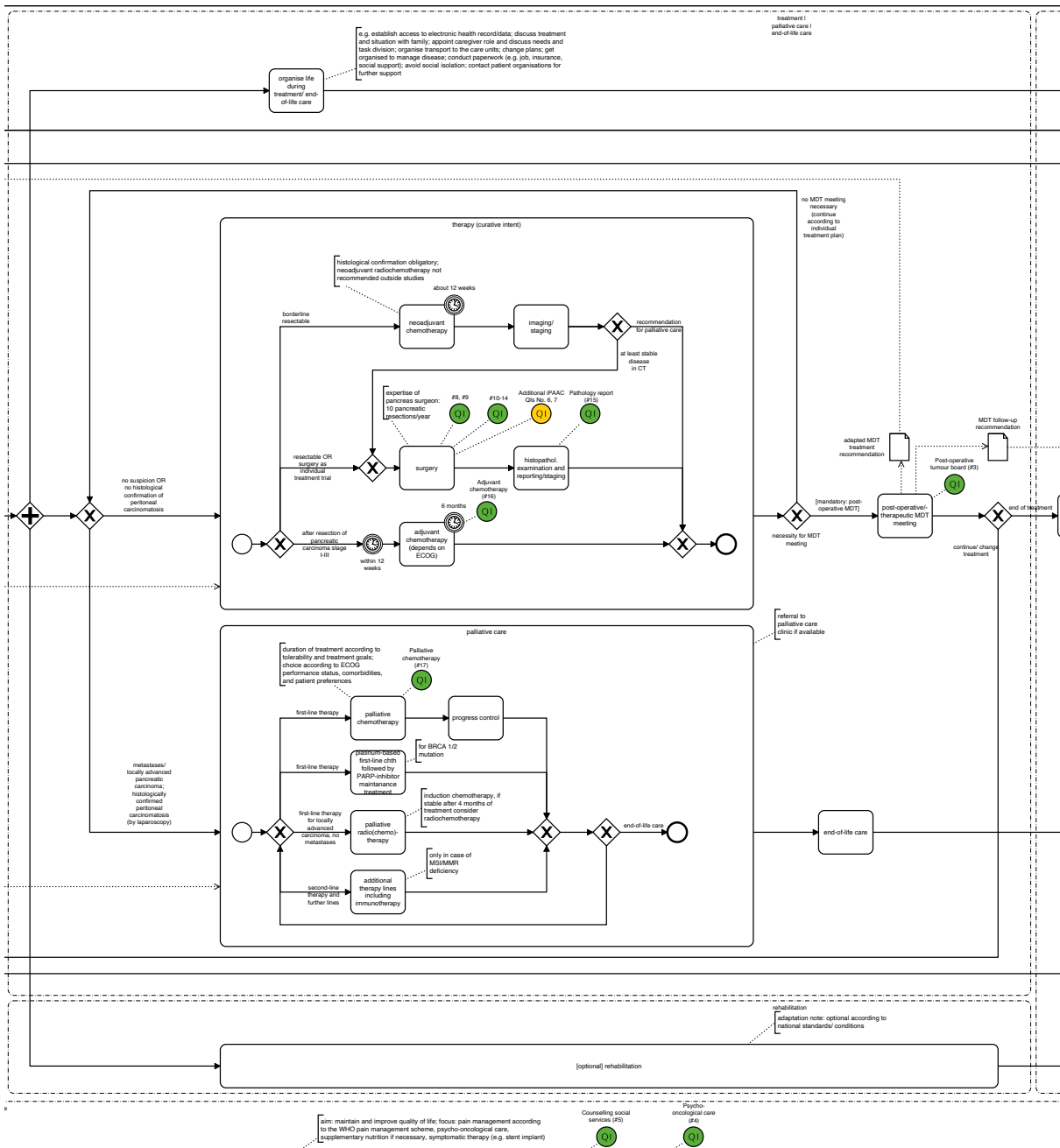


Figure 14. PC patient pathway – part "treatment/ palliative care / end-of-life care"

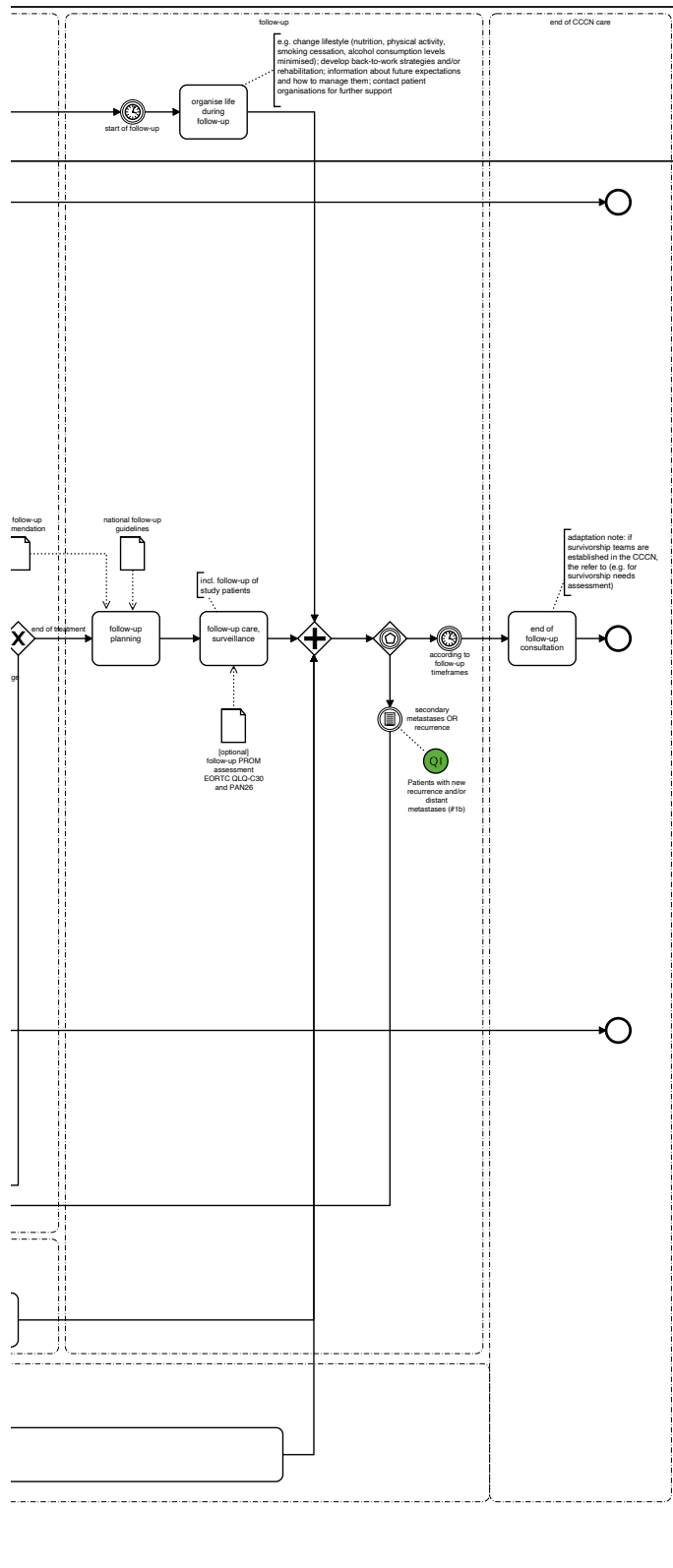
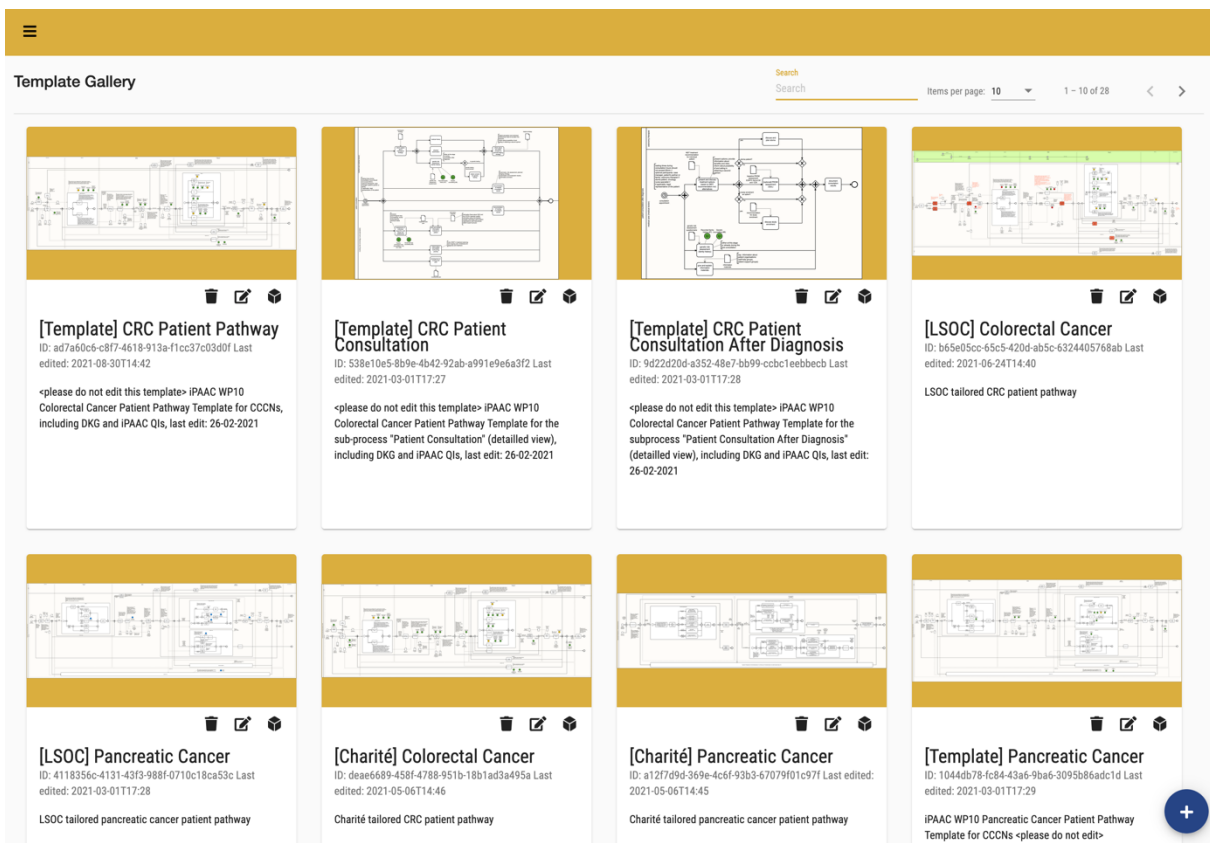


Figure 15. PC patient pathway – parts "follow-up" and "end of CCCN care"

5.4 Patient Pathway Development Tool

For the development of the patient pathway templates as well as for their adaptation to CCCN-specifics, an own iPAAC patient pathway repository (see Figure 16) was provided to and used by the development teams. It allowed for the web-based storage and editing of the patient pathway (template) models and uses an extension of the BPMN language for pathway representation. The iPAAC quality indicators for colorectal and pancreatic cancer can be attached to pathway elements and specified (see Figure 17), e.g. concerning name, quality domain, or calculation (numerator and denominator). The need for special functionalities of the tool, such as colouring of patient pathway elements or searching in complex pathways, were identified and added in the piloting phase.



The screenshot shows a web-based interface for a 'Template Gallery'. At the top, there is a search bar and navigation options like 'Items per page: 10' and '1 - 10 of 28'. Below this, a grid of eight pathway templates is displayed. Each template card features a BPMN diagram at the top, followed by a title, ID, last edit date, and a disclaimer. The templates are:

- [Template] CRC Patient Pathway**: ID: ad7a60c6-c8f7-4618-913a-f1cc37c03d0f Last edited: 2021-08-30T14:42. Disclaimer: <please do not edit this template> iPAAC WP10 Colorectal Cancer Patient Pathway Template for CCCNs, including DKG and iPAAC QIs, last edit: 26-02-2021
- [Template] CRC Patient Consultation**: ID: 538e10e5-8b9e-4b42-92ab-a991e9e6a3f2 Last edited: 2021-03-01T17:27. Disclaimer: <please do not edit this template> iPAAC WP10 Colorectal Cancer Patient Pathway Template for the sub-process "Patient Consultation" (detailed view), including DKG and iPAAC QIs, last edit: 26-02-2021
- [Template] CRC Patient Consultation After Diagnosis**: ID: 9d22d20d-a352-48e7-bb99-ccb1eeb3ebc Last edited: 2021-03-01T17:28. Disclaimer: <please do not edit this template> iPAAC WP10 Colorectal Cancer Patient Pathway Template for the subprocess "Patient Consultation After Diagnosis" (detailed view), including DKG and iPAAC QIs, last edit: 26-02-2021
- [LSOC] Colorectal Cancer**: ID: b65e05cc-65c5-420d-ab5c-6324405768ab Last edited: 2021-06-24T14:40. Description: LSOC tailored CRC patient pathway
- [LSOC] Pancreatic Cancer**: ID: 4118356c-4131-43f3-988f-0710c18ca53c Last edited: 2021-03-01T17:28. Description: LSOC tailored pancreatic cancer patient pathway
- [Charité] Colorectal Cancer**: ID: deaee6689-458f-4788-951b-18b1ad3a495a Last edited: 2021-05-06T14:46. Description: Charité tailored CRC patient pathway
- [Charité] Pancreatic Cancer**: ID: a127d9d369e-4c6f-93b3-67079f01c97f Last edited: 2021-05-06T14:45. Description: Charité tailored pancreatic cancer patient pathway
- [Template] Pancreatic Cancer**: ID: 1044db78-fc84-43a6-9ba6-3095b86adc1d Last edited: 2021-03-01T17:29. Description: iPAAC WP10 Pancreatic Cancer Patient Pathway Template for CCCNs <please do not edit>

Figure 16. iPAAC patient pathway (template) repository

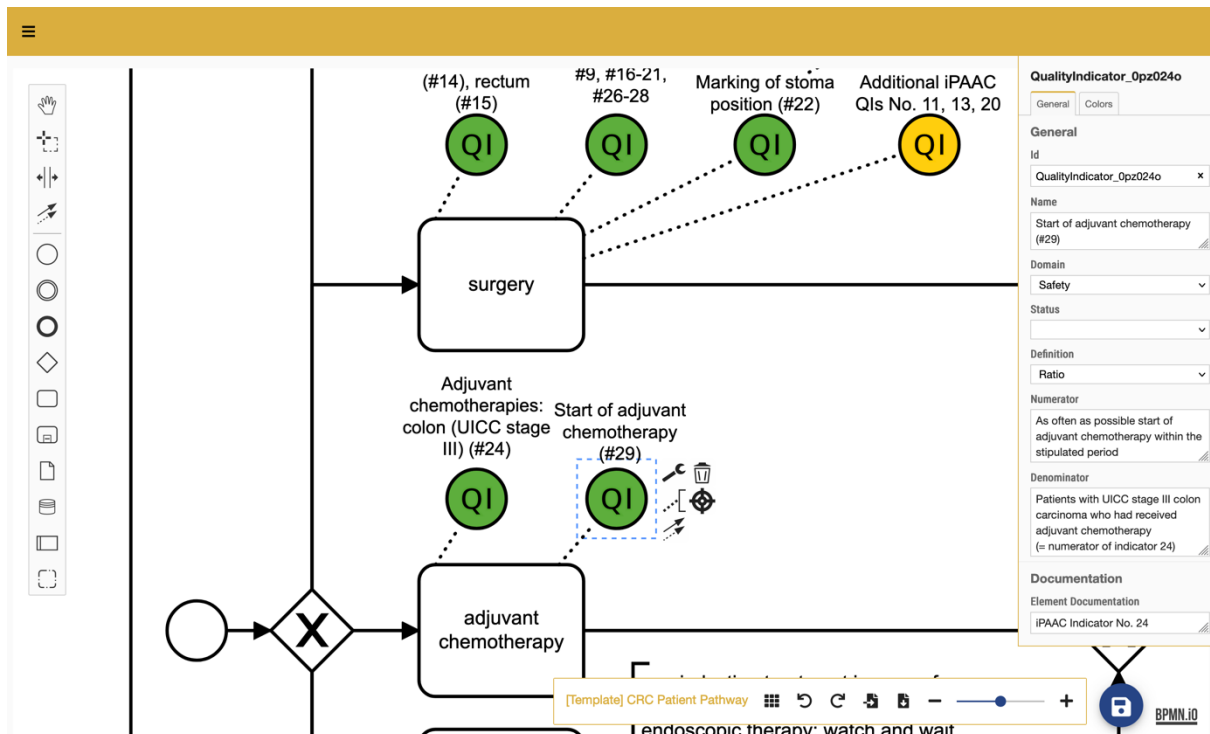


Figure 17. Quality indicator representation and specification in the iPAAC patient pathway modeller

5.5 Lessons Learned from Piloting

The application of the iPa²-Guide with the two use cases and in the two pilot CCCNs allowed to generate knowledge and to gain experiences about its methodical steps and usability in practice. The following lessons learned can be noted with this regard.

- The iPa²-Guide provides a common understanding, structure and uniform process for the patient pathway development team. This helps to organise the pathway development in a multi-professional, interdisciplinary team.
- Patient pathway development and the adaptation of patient pathway templates to national, regional and local conditions of a CCCN are complex iterative processes which need sufficient framing as given with the iPa²-Guide.
- The commitment of the patient pathway development team in a CCCN is crucial for successful patient pathway development and depth of implementation.
- Digital application support for template adaptation and patient pathway modelling is highly appreciated by the pathway development team. A unified tooling allowing for digital development, export and exchange of patient pathway templates and their individual adaptation is highly recommended – as is a centralised patient pathway template repository for CCCNs.

6 Summary and Conclusion

The iPa²-Guide adds and summarises the missing building blocks to truly utilise the benefits expected by patient pathway implementation in CCCNs. It establishes the foundation for a common terminological basis and understanding of patient pathways in science and practice and provides methodical support for the development and implementation of patient pathways in CCCNs. Therefore, a template-based patient pathway approach was elaborated. It includes the development of generic patient pathway templates and their adaptation and implementation in CCCNs. The iPa²-Guide describes the necessary methodical steps for these purposes and thus, constitutes the basis for more uniform, structured and simpler patient pathway development and implementation processes in CCCNs. This shall boost the achievement of a uniformly high level of patient-centred quality care across European CCCNs.

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