D7.8 MAST 2.0 Manual

WP7 Synergy Implementation

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Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Executive summary

This deliverable summarises the work on extending the MAST framework to include integrated care. The main part of the report presents the process of adapting the original MAST into MAST integrated care to serve as a basis for decision making on the use of ICT supported integrated care in the EU and European countries.

Since the new MAST integrated care is an expansion and not an improvement of the original MAST framework it has been decided to name the new framework "MAST-IC" and not MAST 2.0 as described in the DoW.

The overall aim of the MAST-IC is to improve the possibilities for decision makers to choose the most appropriate ICT supported integrated care services to be used in the most cost-effective way by providing a multidisciplinary assessment based on scientific methods and results.

The development of the model is based on experiences achieved in three European projects deploying ICT supported integrated care and using the original MAST as an evaluation framework. Results from a workshop with experts within the field of integrated care and a systematic literature review have been used in the development process. The framework represents one of the synergies between BeyondSilos, CareWell and SmartCare.

The MAST framework for ICT supported integrated care includes the following steps:

- **Step 1:** Preceding considerations of a number of issues to be considered before an assessment of ICT supported integrated care is initiated, e.g. maturity.

- **Step 2:** A multidisciplinary assessment of the outcomes of ICT supported integrated care within seven domains.

- **Step 3:** An assessment of the transferability of results found in the scientific literature and results from new studies.

This report describes a number of aspects, methods and topics that can be relevant in each of the seven domains included in the multidisciplinary assessment. For each of the

seven domains, a number of topics are described. Appendix A contains suggested outcome measures for each topic. The report includes a short description of considerations regarding transferability of the service.

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1 Introduction

1.1 Purpose of this document

The overall purpose of the MAST 2.0 manual is to provide a structured framework for assessing ICT supported integrated care. This document presents the results of phase 5 of the extension of MAST (T7.5 in the DoW) for the preparation of the set of manuals and tools to document the MAST 2.0 framework. The manual has been prepared based on the previous four phases in this task.

To ensure coherence with the original MAST framework, this MAST 2.0 manual follows the structure and content of the original MAST manual [1].

1.2 Structure of document

The MAST 2.0 Manual document summarises the first steps achieved with regards to extending MAST [1], which is a framework for assessment of telemedicine, to a framework that can be used in the assessment of ICT supported integrated care interventions. Since MAST 2.0 for integrated care is an expansion and not an improvement of the original MAST framework, it has been decided to name the new framework "MAST-IC" and not "MAST 2.0" as stated in WP7 in the DoW for the SmartCare project [2].

Whenever MAST is mentioned as "MAST" throughout the document, it refers to the original MAST model for assessments of telemedicine applications and MAST-IC refers to the extended version of MAST for assessments of ICT supported integrated care.

The main part of the report presents the process of adapting the original MAST into MAST-IC for integrated care.

In the section 2 below, the background and purpose of the development of the framework is described.

The methodology used in the process is described in section 3.

The results from the different parts of the process are presented in section 4; section 4.1 presents the results from a workshop with stakeholders, and section 4.2 presents the results from a literature review. These results have been used as inputs in the development of MAST-IC. Section 4.3 describes the aim and the content of the framework and how MAST-IC can be used in practice. Section 4.3.5 describes the content of the seven domains in MAST-IC in more detail, and section 4.3.6 describes how the transferability of the results from an assessment can be made.

The results achieved and a description of MAST-IC are discussed in section 5, including an analysis of the strengths and weaknesses of the framework and the relation between MAST and MAST-IC.

In the conclusion, in section 6, the results of the development of MAST-IC are summarised, and possible future developments of the framework are considered.

Finally, the appendix describes each domain in detail including suggestions for topics and outcome measures.

1.3 Glossary

CR   Care Recipient
DoW   Description of Work
EC   European Commission
ICT   Information and Communication Technology
MAST   Model for Assessment of Telemedicine
WP   Work Package

1.3 Glossary

2   Background

2.1 The background

As Europe's population ages and the number of people with chronic conditions increases, it has become an urgent task for caregivers and policy makers to find a sustainable solution in order for the health system to face this burden. The way people today are supported and cared for in health care settings and institutional care settings are regarded as both socially and economically unsustainable, which makes it inevitable that present care methods have to change. Integrated care has been suggested as one solution [3,4].

For years, integrated care supported by information and communication technologies (ICT) has had the attention of the European Commission (EC). Lately, the three projects SmartCare [5], BeyondSilos [6] and CareWell [7] have been funded by the EC. The overall aim of these three projects is to meet the complex needs of the citizens as well as the demands of care givers and formal and informal institutions in a new way by implementing integrated, ICT-based health and social care interventions. Thus, these pilots introducing ICT-based integrated care across countries in the European Union have been launched over the last three years. All three projects have used the MAST framework for assessment of telemedicine as the evaluation methodology [1]. However, this framework does not have specific guidelines on how to evaluate ICT supported integrated care, and no specific methods or outcome measures of integrated care are suggested in the framework. Based on the preliminary experience from the use of MAST in these three projects, a clear need has emerged for an expansion of the framework to a separate framework assessing ICT supported integrated care.

Previous research has shown inconclusive results regarding the benefits of integrated care [8,9]. Various explanations to the diverse results have been suggested, such as: the conceptual diversity used to evaluate integrated care initiatives; the need for proper outcome measures; and the lack of a common definition of the underlying concept of integrated care [8,10,11]. These issues create challenges in assessments and interpretation of integrated care initiatives and comparisons between them.

Based on the implications found in the scientific literature and the experience from the use of MAST in large European projects of integrated care, it seems urgent to develop an assessment framework that can ensure a rigorous evaluation of integrated care in order to support policy makers and care givers regarding their choices in the allocation of limited resources.

2.2 Definition of integrated care

Integrated care has been defined in different ways by different authors. For the purpose of the development of the MAST 2.0 manual, the following definition of integrated healthcare delivery by Stranberg-Larsen et al (2009) has been adopted: "A coherent and coordinated set of services that are planned, managed and delivered to individual service users and populations across a range of organisations and by a range of cooperating professionals and informal careers" [11].

In order to recognise that the target population for integrated care services are people in society who need a service for shorter or longer periods of time, "service users" are named "citizens" throughout this report. The term care recipient has been used in the three projects SmartCare, BeyondSilos and CareWell, but during the Delphi process it became clear that the workshop participants preferred the term "citizen" to cover the more active role of the citizen in both health and social care aspects, . Whenever the term "citizen" is

used in this document, it refers to the specific population that is part of the study / project being assessed.

2.3 Outline of MAST

Originally, the objective of MAST was to produce a basis for decision makers when decisions on investment in new telemedicine services had to be made [1]. This deliverable describes how MAST has been adapted to produce a basis for decision makers when they have to make decisions on investment in new ICT supported integrated care services.

MAST is used to describe the effectiveness and contribution to quality of care of telemedicine applications, and to produce a basis for decision making. An assessment based on MAST includes a multidisciplinary process which summarises and evaluates information about the medical, social, economic and ethical issues in a systematic, unbiased and robust manner. In practice, the original MAST framework included three elements:

1. Preceding considerations of a number of issues to be considered before an assessment of a telemedicine application is initiated, e.g. maturity.

2. A multidisciplinary assessment of the outcomes of telemedicine within seven domains:
    o Domain 1: Health problem and characteristics of the application.
    o Domain 2. Safety.
    o Domain 3. Clinical effectiveness.
    o Domain 4. Patient perspectives.
    o Domain 5. Economic aspects.
    o Domain 6. Organisational aspects.
    o Domain 7. Socio-cultural, ethical and legal aspects.

3. An assessment of the transferability of results found in the scientific literature and results from new studies.

In SmartCare and BeyondSilos, the MAST framework was adapted in terms of wording to reflect the focus on integrated care instead of the telemedicine aspect. Step 1 and 3 remained the same, but the domains in step 2 were re-named as shown below:

1. Preceding considerations of a number of issues to be considered before an assessment of ICT supported integrated care is initiated, e.g. maturity.

2. A multidisciplinary assessment of the outcomes of integrated care within seven domains:
    o Domain 1: Health and social situation of the care recipient and characteristics of the service.
    o Domain 2: Safety.
    o Domain 3: Clinical and care effectiveness.
    o Domain 4: Care recipient perspectives.
    o Domain 5: Economic aspects.
    o Domain 6: Organisational aspects.
    o Domain 7: Socio-cultural ethical and legal aspects.

3. An assessment of the transferability of results found in the scientific literature and results from new studies.

In this document, the domains have been developed further in terms of content and wording which are described in the following sections. The result is the first version of the MAST-IC.

3   Methodology

This section describes the methods used in Delphi process and the literature review that constitutes the basis for the adaptation of MAST for integrated care.

3.1 Delphi Process

In the DoW, the task of extending MAST included two validation workshops. In order to gather the information from the workshops according to a validated process and in a systematic manner, the workshops were incorporated in a Delphi process, and thus supported by questionnaires.

The Delphi method [12] is used to achieve convergence of opinions concerning real-world knowledge solicited from experts within certain topics. The aim of using this technique is to conduct a detailed examination and discussion of a specific issue for the purpose of goal setting, policy investigation, or prediction of the occurrence of future events through a group communication process. The Delphi technique is suited as a method for consensus building, using a series of questionnaires to collect data from a panel of experts. In practice, the Delphi process involves three to four rounds of oral or written evaluation.

A modified Delphi process was used in the process of expanding MAST to MAST-IC; this includes the following rounds, identical to the Delphi study described in D7.1:

Round 1: Development of a structured questionnaire about the importance of the different domains and topics in MAST including the alterations of the domains in terms of wording corresponding with the reporting guideline of SmartCare and BeyondSilos.

The structured questionnaire included questions about the importance of the seven MAST domains and the topics within the domains. In addition, seven questions were included in the questionnaire about the importance of information related to the transferability of information from the different domains.

The importance of each domain and each topic within each domain was assessed on a 0-3 Likert scale:

- 0 = Not important.
- 1 = Somewhat important.
- 2 = Moderately important.
- 3 = Highly important.

If 70% or more of the respondents found a domain and topic "Moderately important" or "Highly important" it was used as an indication of the participants' consensus with regard to the face validity of the domain or topic.

Round 2: Presentation of information about MAST and examples of the use of MAST to the workshop participants, and subsequently asking them to answer the Delphi questionnaire individually at the workshop. See all participants in Appendix A in D7.3.

Round 3: Discussion of the validity of MAST for integrated care at the workshop.

Round 4: Submission of the online version of the questionnaire and the results from the second round (the paper version of the questionnaire) to the participants. This was done one week after the workshop.

The online version of the questionnaire included the same questions as the ones in the paper version distributed in round 2. In addition, information about the proportion of responses indicating that the information was considered moderately or highly important

was included. The purpose of the second questionnaire was also to validate the responses received at the first Delphi questionnaire. The comments from the first Delphi questionnaire were reviewed and 12 overall aspects were defined and incorporated in the second questionnaire to confirm or disconfirm the respondents' opinion about these overall aspects. The respondents were asked whether there should be more focus on each of the aspects to which they could answer "yes", "no", and "don't know".

The Delphi process is described in more detail in D7.1 and D7.3 which contains the detailed reports about the validation workshops.

3.2 Literature review

As described in section 2, assessment studies of integrated care lack consensus regarding how to evaluate and measure integrated care, which is the rationale behind the literature review. This often results in the use of local evaluation models which are created or adapted for the purpose of the specific intervention or only focus on selected aspects of the integration, disregarding other important outcomes.

Therefore, the aim of the literature review was to conduct a thorough review of empirical research assessing integrated care in order to support the development of an extension of MAST to be used in assessing ICT supported integrated care interventions.

The main objective addressed in the literature review was: What outcomes are used when evaluating integrated care interventions?

In addition, it was planned to collect information regarding: 1) Research objectives in focus 2) ICT solutions supporting integrated care, 3) participants, 4) interventions, 5) comparisons, 6) effects, 7) evaluation frameworks and 8) facilitators and barriers of the implementation of integrated care intervention.

In the literature search, articles regarding ICT supported integrated care was of special interest.

3.2.1 Strategy for literature search

A literature search was performed on the four electronic databases: MEDLINE/PubMed, EMBASE, CINAHL/EBSCO, and the Cochrane Database. These databases were selected in order to perform a comprehensive search covering a broad range of disciplines related to integrated care.

Initial literature search

An initial literature search was performed covering the period from 1st January 2000 to 1st March 2016. The search included the subject headings (Mesh terms in PubMed) for the following two groups of search terms 1) Integrated care and 2) Evaluation. The search was combined with a targeted "keywords search" for the same two groups in PubMed covering the last six months. Studies were included based on specified eligibility criteria. The literature search identified 1,425 records. 75 potentially relevant articles were retrieved in full text. However, when assessing the selected articles, it became evident that the sensitivity of the literature search was low, and did not cover the intended aspects of integrated care. As a consequence of this, the search terms and eligibility criteria were adjusted, and a new literature search was performed; this is described below.

Final literature search

The initial literature search for "Integrated care" was repeated. However, the search was restricted only to studies including the term "measure*" (*denotes that different suffixes

have been used). The search term "evaluation" was no longer included in the search. In addition, it was decided to restrict the search to systematic reviews to optimise the search in the databases and get a comprehensive overview of outcomes used in integrated care interventions. Only reviews published in the last 10 years (1st January 2006 to 13th July 2016) were included.

3.2.2 Eligibility criteria

A systematic review was defined as an overview with an explicit question and a method section with a clear description of the search strategy and the methods used to produce the systematic review. The review should also report and analyse empirical data. The following inclusion and exclusion criteria were used when selecting relevant reviews.

Reviews were included if they:

- Described an integrated care intervention including a health organisation or a partner (professional) from the healthcare sector and measured some aspects of integrated care.
- Analysed empirical data and clearly described methods and outcomes in assessing integrated care.
- Included populations of patients or citizens (regardless of diagnoses or conditions), professionals or caregivers (both informal and formal).
- Published in the period from 1st January 2006 and 13th July 2016.

Reviews were excluded if they:

- were written in other languages than English;
- described interventions targeted exclusively at developing countries.

Since none of the reviews located in the literature search focuses specifically on integrated care supported by ICT, no restrictions regarding the inclusion of ICT solutions has been made.

3.2.3 Study selection

All citations were imported into the reference management software package EndNote where duplicate citations were removed. The main investigator screened the lists of titles / abstracts located in the literature searches, and identified potentially relevant studies which were retrieved in full texts. The basis for the selection was the criteria for inclusion and exclusion above. Only articles that could be obtained through institutional holdings available to the investigator were included in the review.

3.2.4 Data collection and assessment

All potentially relevant systematic reviews were assessed in full text using a data extraction table specifying the following information: Author, publication year, title, journal, number of studies, geographical coverage of review, time frame of included studies, aim/objective and outcomes. Identified outcomes and descriptive characteristics were organised in accordance to the existing MAST domains: domain 1 health problem and characteristics of the application, domain 2 safety aspects, domain 3 clinical aspects, domain 4 patient perspectives, domain 5 economic aspects, domain 6 organisational aspects, and domain 7 socio-cultural, ethical and legal aspects. If identified outcomes could not be included under one of the MAST domains, they were categorised separately for the purpose of developing additional domains for the MAST-IC framework.

Due to the expected heterogeneity of studies, regarding both participants, interventions and outcomes, only narrative summaries of the results of the systematic reviews were planned.

4 Results

The result section includes the results obtained from the Delphi process and the literature review. These results serve as the foundation for the expansion of MAST to MAST-IC.

4.1 Results from Delphi

In March 2016, a workshop with 19 participants was held to validate the original MAST framework for assessment of telemedicine to establish whether or not the framework had proven valuable as the basis for decision making related to investment in telemedicine solutions. The participants in the workshop were decision makers and experts in the field of telemedicine in Europe. This workshop and the Delphi process that supported the workshop confirmed the validity of the framework, and was a prerequisite for the further validation of MAST for integrated care, but is not mentioned further in the MAST 2.0 Manual.

In June 2016, a second workshop was held to validate the extension of the existing MAST framework to the assessment of ICT supported integrated care. In total, 61 people were invited; out of these, 17 accepted the invitation to participate. The participants in the workshop were decision makers, experts and researchers in the field of integrated care from a broad range of European regions.

The Delphi questionnaires confirmed that the existing MAST domains and topics should also be part of the assessment of ICT supported integrated care. Therefore, these domains and topics were transferred to the adapted MAST-IC framework in the MAST 2.0 Manual. However, during the workshop, adjustments were pointed out, and some changes were requested by the participants. These adjustments were related to the need for more focus on the citizens and their relatives, and on the local context where the integrated care service is implemented. In addition, the discussion revolved around the definition of integrated care and the purpose of implementing these services.

The first Delphi questionnaire was distributed during the workshop, so the response rate was 100%. In the second Delphi questionnaire, 16 out of 17 respondents answered the questionnaire. The one respondent that did answer the questionnaire was on holiday and therefore unable to submit a response within the deadline.

During the Delphi process, the participants provided a number of comments related to the use of the existing framework and how it could fit the assessment of integrated care. These comments have been incorporated in the relevant domains. For example, the need for a description of the local context and the citizen's needs have been incorporated as topics in Domain 1. The use of home care has been incorporated in Domain 3, and aspects of data safety have been incorporated in Domain 2 and 7. Some of the elements mentioned were already part of the MAST framework; it was therefore not necessary to incorporate them any further. However, these elements were further elaborated if they were unclear in the original framework.

The results identified in the Delphi process have been included in the development of the MAST-IC framework described in section 4.3 below, both as a basis for the overall description of the framework, and as examples of measurement of the different outcomes of integrated care.

The main comments from the first questionnaire, the second questionnaire, and discussion from the workshop are summarised in Table 1 below:

Table 1: Results from Delphi

1st Delphi round (1st questionnaire)	3rd Delphi round (discussion during workshop)	4th Delphi round (2nd questionnaire)
The following comments were made in the first Delphi questionnaire: • Description of citizen needs (both health and social) and purpose of the service. • Description of the local context. • Aspects of data safety. • Description of personal safety (i.e. related to falls, drugs, drug interactions, adverse events). • Maintenance of the technical service (including certification). • Satisfaction of informal carers. • Risk stratification. • Patient perception in terms of quality of care and coordination, and motivation. • Description of changes in the ecosystem surrounding the patient (citizen) i.e. disruption in work relations. • Staff empowerment. • Assessment of impact on legal aspects. • Assessment of coordination (integration). • Addressing cultural aspects in relation to transferability.	The following issues were central in the discussion of the content of MAST at the workshop: • The elements related to domain 7 should be more dominant, as they contribute to the context where the integrated care service is implemented. • Consider the possibility of measuring the level of integration. • The focus on the end user should be increased. Integrated care is not only about the technology, but also the citizen's needs. • Consider an increased focus on the relatives and informal carers. • The use of the term "care recipient" might indicate a passive user; the term "citizen" should be considered. • Political strategies and goals related to the integrated care service should be considered. • The difficulties related to assessing integrated care were addressed, as integrated care services are very complex and comprehensive.	The following comments were made in the second Delphi questionnaire: • Include organisational profiles and profiles of professionals. • Description of changes in work procedures in relation to integrated care. • Assessment of independence and mental well-being. • Security related to psycho-social issues. • Measurements of survival rates could be more interesting than mortality rates. • Reasons for drop-outs. • Use of home care. • Assessment of changes in quality of individualised care plans. • Assessment of changes in quality of patient's needs assessments. • Assessment of effects on perception of coordination. • Perception of carers as they can be important in the successful implementation of IC service. • The business case for the integrated care organisations as a whole including shifts of resources and costs. • The overall investment for the implementation. • The common view of the care strategy. • Assessment of collaboration between care providers.

4.2 Results from the literature review

The search for reviews of integrated care assessments from 2006 to the present was performed in July 2016. The search resulted in 408 abstracts of reviews which were assessed in terms of relevance. In the end, 31 systematic reviews were included for full text analysis and finally 26 reviews were found relevant for inclusion [8,10,13].

Based on these reviews, outcomes used for evaluating integrated care in a broad range of populations, including interventions targeting people with chronic conditions, depression, older people and children were extracted. The main findings were:

- The majority of studies reviewed were quantitative outcome / effect studies.

- Most studies focus on disease specific outcomes or outcomes related to utilisation of care (mostly healthcare utilisation such as hospitalisations and re-admissions, and to a lesser degree utilisation of social care such as home and community based services.

- Need for studies to include more diverse populations.

- Need for more studies to include outcomes on carers' perspectives such as burden and satisfaction (both informal and formal carers).

- Need for the development of standardised tools to measure the citizens' perception of care.

- Need for the development of standardised tools to measure the relatives' perception of care.

The systematic review will result in a publication regarding the methodologies for assessing integrated care, Daugbjerg et al (paper under development).

The results from the literature identified in the literature review have been included in the development of the MAST-IC framework described in section 4.3 below, both as a basis for the overall description of the framework, and as examples of measurement of the different outcomes of integrated care.

4.3 MAST-IC manual

4.3.1 The aim of MAST-IC

The aim of MAST-IC is to improve the possibilities for decision makers to choose the most appropriate ICT supported integrated care services to be used in the most cost-effective way by providing a multidisciplinary assessment based on scientific methods and results.

4.3.2 How to use MAST-IC

MAST is not a fixed model for assessing care services, and the framework need to be adapted according to the population and service being investigated. Therefore, this MAST-IC manual should be seen as a guideline for the relevant aspects to be considered when decisions are made on implementing integrated care.

When a MAST-IC evaluation is carried out, it is important to tailor the outcomes and outcome measures to the specific study and population. In addition, a detailed reporting guideline should be developed for the specific study / project in order to tailor the MAST-IC assessment to the requirements of the specific project. In addition, the reporting guideline should reflect how the results should be reported.

According to the original MAST manual [14], the framework can be used for different purposes. It can serve as:

1) a basis to design new studies of the outcomes of ICT supported integrated care services;

2) a checklist to include the proper domains, outcomes and indicators in new studies of ICT supported integrated care services; and

3) a framework for an assessment based on existing literature reviews, studies and information on the specific ICT supported integrated care service.

4.3.3 The elements of MAST-IC

Based on the experiences from the three European projects SmartCare [5], BeyondSilos [6] and CareWell [7], and the results of the Delphi process and literature review, the MAST framework has been adapted to ICT supported integrated care; MAST-IC includes the following domains as shown in Table 2 below:

Table 2: Domains in MAST-IC

Domain number	Integrated care
1	Health and social situation of the citizen and characteristics of the service
2	Safety
3	Clinical and care aspects
4	Citizens' perspectives
5	Economic aspects
6	Organisational aspects
7	Socio-cultural, ethical and legal aspects

Each domain represents the viewpoints of both health, social, and informal care perceived not as separate silos, but as one service provider.

In line with the original MAST, MAST-IC includes the following steps:

- **Step 1:** Preceding considerations of a number of issues to be considered before an assessment of ICT supported integrated care is initiated, e.g. maturity.

- **Step 2:** A multidisciplinary assessment of the outcomes of ICT supported integrated care within seven domains:
  - Domain 1: Health and social situation of the citizen and characteristics of the service.
  - Domain 2: Safety.
  - Domain 3: Clinical and care aspects.
  - Domain 4: Citizens' perspectives.
  - Domain 5: Economic aspects.
  - Domain 6: Organisational aspects.
  - Domain 7: Socio-cultural ethical and legal aspects.

- **Step 3:** An assessment of the transferability of results found in the scientific literature and results from new studies.

4.3.4 Step 1 - Preceding considerations

Before the outcomes of an integrated care service are assessed, it is important that a number of preceding considerations are made in order to determine whether it is relevant to carry out the assessment at this point in time.

First it is important to determine the aim of the service and relevant alternatives with which the service must be compared in the assessment.

The description of the aim of the service should include a description of the citizens in question, their health and social situation / needs, and the aim of using the service and ICT. Thus, first should be described how the ICT supported integrated care service is expected to be an improvement compared to other services and technologies used for the same target population.

The following aspects should be considered:

- Purpose of the service:
  - o Why should the service be implemented and what is the benefit?
- Relevant alternatives:
  - o Are there any alternatives to the service?
  - o Why is this particular service an improvement compared to other services available?
- Legislation:
  - o How does ICT supported integrated care service fit into the existing legislation and regulatory frameworks?
  - o Are all legal aspects in terms of permits in place incl. data sharing and data security?
- Reimbursement:
  - o How is the service reimbursed in the involved organisations?
- Maturity and timing:
  - o How mature is the service?
  - o How does the service fit in with the existing organisational set-up?
- Number of citizens:
  - o What is the relevant number of citizens expected to use and benefit from the service?

4.3.5 Step 2 - The domains in MAST-IC

In accordance with the results from the Delphi process and the literature review, the existing MAST domains and topics have been confirmed to be valuable for integrated care assessments. Some elements have been modified and adapted to fit MAST-IC. However, relevant parts from the original MAST manual have been transferred to this manual.

4.3.5.1 Domain 1: Health and social situation of the citizen and characteristics of the service

Domain 1 should include a description of the health and social situation including the needs of the citizens in the targeted population, and a description of the charecteristics of the service being tested to support the citizens' situation and meet their needs. The current local context in which the new service is being deployed should also be described.

This domain should provide the decision makers with solid background information including a description of the service, the ICT solutions that are available, the need for training resources, and the division of responsibility between organisations and carers involved in the provision of care.

The topics within this domain include a description of the epidemiology of the targeted condition(s) (both health and social), and the burden for the individual citizen and on society as a whole caused by them. A description of the regulatory status of the integrated care service and the requirements for its use should also be included. The description of the current status of the service provides a baseline description which is a useful starting point for further parts of the assessment, and serves as a comparison for assessing potential improvements in the service.

As the framework is adapted to assess ICT supported integrated care, the technical characteristics of the ICT should be described. This includes issues such as the need for a common infrastructure covering all involved organisations, and the need for interoperability. Interoperability refers to the integration needs with regards to other clinical or administrative systems such as electronic care records, administrative systems, clinical databases, social care systems, other applications etc. The assessment must also include a description of the need for user support, help desk functions and back-up systems and procedures.

Note that ICT supporting integrated care reflects complex interventions involving many stakeholders and participants. The detailed description of the service and the technical characteristics in this domain are therefore an important part of the full description of the service being assessed that will benefit other institutions considering using the service.

Topics

The following topics can be included in the assessment of the health and social situation and needs of the citizens, and the characteristics of the service:

- Description of the local context.
- Health and social situation of the citizen.
- Description of the citizens' needs.
- Description of the service.
- Technical characteristics.

4.3.5.2 Domain 2: Safety

Safety is defined as the identification and assessment of harms related to the use of ICT supported integrated care services. Safety should be divided into a description of potential harms, and an assessment of the actual harms identified in the intervention period. ICT supported integrated care issues of safety are divided into care related safety and technical safety.

Care related safety includes the assessment of potential harms inflicted on the citizen using the service. This description should include the type of harms, their incidence, and their severity. This may cover aspects such as adverse events caused by failures of communication between the different care providers, safety issues related to using multiple types of medication provided by different care givers, or information record accuracy.

Technical safety includes issues related to the technical reliability of the service, including an assessment of backup, interference and security of data. It may also cover aspects such as information gaps between organisations and/or care givers, and system errors.

Note that care related safety and technical safety are highly interlinked. As an example, problems with the technical reliability of the service may result in wrong decisions made by the carers which could harm the citizen. However, in the presentation of data collected on safety, it can be practical to divide the data into information about care related safety and information about more technical issues.

Topics

The following topics can be included in the assessment of safety:

- Care related safety (citizens and care providers).
- Technical safety (technical reliability).

4.3.5.3 Domain 3: Clinical and care aspects

The assessment of clinical and care aspects depends on the condition and situation of the citizens being assessed.

The outcome measures should be selected based on which topics and issues are considered relevant to assess. When assessing integrated care involving both health and social care providers, it is important not only to measure health related outcomes, but to include social outcomes as well. For example, in the literature on integrated care interventions, different aspects of quality of life appear, which is not only restricted to health related quality of life; other aspects include: life satisfaction, mood, mental health related quality of life, and loneliness. Another example is the measurement of use of care, which should be considered to include all relevant care services, e.g. admission to nursing homes, use of home care services, hospitalisations and re-admission to hospital, etc.

In MAST-IC, use of care services can be used both as an indicator for the health and wellbeing status of the citizen, but also as an indicator when estimating the economic outcome of care (see section 4.3.5.5).

It is sensible to use validated outcome measures wherever these are appropriate and available, as they can facilitate comparisons between the findings of different studies. However, suitable validated instruments are not always available. When reporting outcomes, general guidelines for reporting scientific results should be followed.

Topics

The following topics can be included in the assessment of the clinical and care aspects:

- Use of care services, e.g. number of contacts with care providers divided into type of contact.
- Effect on care, e.g. disease management, waiting time for medication, social dependency, social functioning.
- Effects on mortality:
  - Condition specific mortality or overall mortality.
- Effects on morbidity:
  - Condition specific morbidity or overall morbidity.
- Effects on quality of life or general wellbeing:

   o Both generic and condition specific.

- Behavioural outcomes, e.g. lifestyle changes.

4.3.5.4 Domain 4: Citizens' perspectives

Citizens' perspectives address the ICT supported integrated care intervention from the citizens' point of view, and includes issues related to the perception of and satisfaction with the care.

The citizens' perception and satisfaction with care is an important aspect because integrated care to a larger degree involves citizens and their relatives. ICT solutions are often used as a tool to include the citizens in the communication loop and support their ability to handle their own condition, e.g. in patient-centred care. Therefore, ICT supported integrated care can be expected to affect the citizen's perception of the overall care process.

Relevant measures of the citizen perspective in relation to ICT supported integrated care include: the effect on the citizens' belief in their ability to handle their condition, and the impact of the condition, i.e. measures of self-efficacy. Similarly, empowerment can be an important measure when assessing the ability of an individual to be an active participant in the management of his/her condition.

If citizens are actively involved in the use of the ICT solution, their acceptance, ability and confidence in using the ICT solution should be assessed. This can be done by the inclusion of questions in questionnaires to the citizens. However, it should also be considered to ask citizens who are unwilling to participate why this was the case.

Introduction of ICT supported integrated care can have large effects on how and to what extent informal carers (i.e. relatives, volunteers) are involved in helping and caring for the citizens. Their perspective can be described as a separate topic, or if relevant, included in the topics of the citizens' perspective, depending on the type and degree of involvement in the care.

Topics

The following topics can be included in the assessment of citizens' perspectives on integrated care services:

- Satisfaction and acceptance.
- Understanding of information.
- Confidence (in the care).
- Ability to use the ICT solution.
- Access and accessibility.
- Empowerment, self-efficacy.
- Informal carers' perspective.

4.3.5.5 Domain 5: Economic aspects

Since the general costs of care are increasing, the need to prioritise the limited resources is growing, which is why the assessment of economic aspects of integrated care services is important.

This is relevant at a societal level, but also within the specific care organisations which must decide whether or not to implement new services.

In the economic domain, the use of resources related to the implementation of the integrated care service should be assessed for each care professional, informal carer, relative and citizen. A business case should be produced which should take all relevant care organisations into consideration to cover the full continuum of care. This is particularly important, as increasing the use of home care may increase the social care costs, while reducing healthcare costs by more than this. I.e., there may be a societal gain, but organisational losses.

Topics

The following topics can be included in the assessment of the economic aspects of integrated care services:

- Economic evaluation (societal perspective).
  - Amounts of resources used when delivering the assessed integrated care service and its comparators in the care sectors.

- Business case (institutional level).

4.3.5.6 Domain 6: Organisational aspects

The organisational domain considers what kind of resources have to be mobilised and organised when implementing a new service, and what kind of changes or consequences this can have for the organisation.

ICT supported integrated care may cause extensive organisational changes in structural, cultural and social aspects of the organisation, e.g. new working routines, changes in the distribution of tasks and work load between professions and care providers. Therefore, the organisational aspects should play a significant role in the assessment; an important question to be asked is how the new service will fit within the existing organisational framework.

When describing integrated care services, it is also important to consider the degree of interoperability and the influence on the use of resources (part of the economic domain).

The care providers are important in a successful implementation of new integrated care services. Therefore, the perception of the care providers should also be included in the organisational assessment, e.g. perception of the service, level of satisfaction, and perception of the impact of the service.

A starting point for an analysis of organisational changes in processes could be a mapping of the current work flow and contact points between the care providers and the citizen.

Even though this framework aims at suggesting outcomes which can be isolated and measured with a reasonable effort, descriptions of the various processes and the organisational relationships often include a description of relationships and diagrams rather than statistical measures.

Topics

The following topics can be included in the assessment of the organisational aspects of an integrated care service:

- Process.
- Structure.
- Culture.
- Management.

4.3.5.7 Domain 7: Socio-cultural, ethical and legal aspects

Socio-cultural aspects

The social-cultural topic in the domain focuses on more general implications, such as the diverse social-cultural arenas where the citizen lives and acts while using the service.

The following elements can be included in the assessment of the socio-cultural aspects of integrated care services:

- Changes in the citizen's role in major life areas, e.g. social life, working life.
- Relatives' and others' understanding of the ICT solution and integrated care service.
- Societal, political context and changes. Will the service influence the general model for the delivery of care, if deployed?
- Changes in responsibility. Are the citizens and/or relatives capable of handling the possible responsibility related to receiving the service?
- Gender issues. Does the service have any consequences on the position of gender?

Ethical aspects

Ethical values, moral principles and social rules (norms) form the basis of social life as well as national laws. These factors play a key role in shaping the context in which integrated care services are provided.

Within the assessment, the ethical analysis appraises the ethical questions raised by the service itself, and by the consequences of implementing / not implementing it.

The following elements can be included in the assessment of the ethical aspects of integrated care services:

- Challenges in relation to religion, cultural and/or moral beliefs.
- Potential ethical problems, e.g. giving responsibility to the citizens.
- Autonomy: Is the citizen's independence challenged or increased?
- Equity among different groups in society.

Legal aspects

This part focuses on the legal obligations which must be met, and identifies any specific legal barriers that may exist to the implementation of the service. An assessment should be carried out of the readiness of the existing legal framework to accommodate ICT supported integrated care. If changes are needed, these should be reported.

The legal analysis should identify the legal and regulatory questions raised by the service itself, and the consequences of implementing or not implementing it.

A significant part of the legal assessment will focus on issues of information governance. When ICT supported integrated care involves the processing of person identifiable data shared between different security settings, it is important to assess the information governance model operated by the care institutions. It should be ensured that they are suitably enabled to accept data from external stakeholders.

When ICT supported integrated care services use personal data, the citizen will in many cases have the right to know what data is collected, how it is stored, and who may have

access to it. In many countries, citizens will also have the right to access the data themselves, and to require changes to be made to the data. The assessment should examine how far such rights will reach in relation to the service in question, and if they would cause any organisational issues.

In addition, aspects related to data security and data responsibility should be addressed.

The following elements can be included in the assessment of the legal aspects of integrated care services:

- Professional (clinical / social) accreditation.

- Information governance.

- Professional liability.

- Citizen control: consent, access.

- Data aspects including data security and data ownership.

4.3.6 Step 3 - Assessment of transferability

Assessments of ICT supported integrated care interventions should include considerations of whether the results can be generalised from one setting to another. This consideration should be made within each of the seven domains. A transferability assessment should include considerations regarding whether results can be transferred across borders, to different demographic settings or care groups. This should include whether differences in legislation, reimbursement or organisation of the care sectors makes transferring the results impossible. In addition, possibilities of transferring results from economic evaluations from one setting to another should be addressed.

For further discussions on transferability please consult the original MAST manual (14).

5 Discussion

5.1 General

MAST-IC is based on the users' needs for information in order to make decisions on whether or not to invest in and implement ICT supported integrated care services.

This report describes the relevant multidisciplinary assessment, and summarises information regarding health and social care, economic and ethical issues related to the use of ICT supported integrated care in a systematic, unbiased and robust manner, based on the information gathered from the Delphi process and the literature review. It presents the first steps in expanding MAST to MAST-IC for assessment of ICT supported integrated care.

Based on a Delphi process including questionnaires and a workshop with decision makers, experts and researchers in the field of integrated care, and a systematic literature review, it was confirmed that all aspects and domains of the original MAST framework are important and should be included when evaluating ICT supported integrated care. However, it was also discovered that additional topics or modifications of existing topics were needed in most domains. As an example of this, the topic "Utilisation of health services" in Domain 3, was changed into "Utilisation of care services" to include all care services, e.g. admission to nursing homes, use of home care services, hospitalisations, re-admission to hospital.

In the literature review, it was especially noticed that measures of social aspects are missing; based on the workshop with experts, it was emphasised e.g. that Domain 1 should include a description of the local context and the citizens' needs, both health related and social needs. Another important issue addressed at the workshop and confirmed in the literature review was the assessment of the involvement of informal carers when implementing integrated care, since integrated care can affect how and to what extent they are involved in helping and caring for the citizen. It was therefore considered whether a separate domain should be dedicated to the perspective of informal carers. However, until further research has been made on the informal carers' perspective of ICT supported integrated care, it will remain part of the citizen domain. Lastly, the importance of data security and agreements when sharing sensitive and personal data between sectors and carers has been underlined.

The results have confirmed that an assessment based on MAST-IC should include three elements:

- Preceding considerations of a number of issues that should be considered before an assessment of an ICT supported integrated care intervention is initiated (see section 4.3.4).

- A multidisciplinary assessment of the outcomes of ICT supported integrated care within seven pre-defined domains (see section 4.3.5).

- An assessment of the transferability of results found in the scientific literature and results from new empirical studies (see section 4.3.6).

Measurements of outcomes in new studies based on MAST-IC should include:

- A proper scientific study design including a well-defined method section and description of data collection within each of the seven domains in order to produce valid and reliable assessments of the outcomes of ICT supported integrated care.

- Proper outcome measures that reflect the aim of the ICT supported integrated care intervention, and are based on results from pilots and other relevant studies in the scientific literature.

- Validated and reliable outcome measures whenever possible.

5.2 Strengths and weaknesses

The main strengths of the MAST-IC framework are:

- It is based on the requests and comments from a large group of decision makers and experts in the field of integrated care and ICT solutions.

- It is based on scientific studies.

- It is multidisciplinary and comprehensive.

- Transferability of the estimated outcomes is described.

- It is based on the original MAST framework and experiences from European projects, and therefore familiar to stakeholders in the EU, national health authorities, industry, academia and health professionals.

The main weaknesses of the framework can be described as:

- It can be time consuming if new empirical studies must be initiated.

- It does not result in information on why ICT supported integrated care works. This information needs to be produced in other kinds of scientific studies.

- The framework focuses on the outcomes of ICT supported integrated care (including organisational outcomes), and not on the working processes when introducing the new solutions and services. Information regarding the process of implementing ICT supported integrated care must be produced by using other types of assessments.

- MAST-IC is only relevant in the assessment of mature ICT solutions for integrated care. If the solution is still being developed and still needs to be improved, other kinds of assessments should be carried out, e.g. in formative studies.

- Due to the large diversity within integrated care interventions, it is not possible for the framework to state a number of the criteria to be fulfilled in order to produce an exhaustive evaluation. Nor is it possible to offer a description with off-the-shelf outcome measures specifically tailored to a given intervention. However, the scientific criteria for quality of research within the different scientific disciplines can be used as criteria for reporting when using the framework. A large number of outcome measures based on a comprehensive literature search have been suggested in Appendix A as inspiration for further research.

6 Conclusion

MAST-IC is an expansion of the MAST framework. It a tool to assess ICT supported integrated care interventions that can be used by decision makers in order to make decisions on whether or not to invest in and implement ICT supported integrated care services. The framework describes the relevant multidisciplinary assessment and summarises and evaluates information regarding care, social, economic and ethical issues related to the use of ICT supported integrated care. The relevance of selected outcomes and outcome measures depends on the objective and focus of the intervention.

6.1 Further recommendations

In this report, a preliminary version of a framework for assessing the outcome of ICT supported integrated care interventions has been proposed to guide future assessments. However, there seems to be a need for further development or identification of relevant measures for areas that have not been found to be adequately covered in the scientific literature; the areas identified so far in the literature search carried out (see section 3.2) are:

- social aspects; and
- citizens' and informal carers' perspective of integrated care.

The literature search showed that outcome measures of integrated care are often grouped into siloes according to care provision, e.g. measure either health care outcomes or social care outcomes. Integrated care reflects a pathway where the citizen needs different health and social related services. New measures need to be developed for the measurement of integrated care in order to break down the silo thinking and cover all relevant carers.

Last, a validation of MAST-IC is needed to assess the validity of the defined domains and outcomes in order to make relevant future adjustments. Preferably, the framework should be tested in different settings and across country borders in order to assess the transferability of the framework.

Appendix A: MAST-IC Manual

A.1 Introduction

A.1.1 The aim of MAST-IC

The aim of MAST-IC is to improve the possibilities for decision makers to choose the most appropriate ICT supported integrated care services to be used in the most cost-effective way by providing a multidisciplinary assessment based on scientific methods and results.

A.1.2 How to use MAST-IC

MAST is not a fixed model for assessing care services, and the framework need to be adapted according to the population and service being investigated. Therefore, this MAST-IC manual should be seen as a guideline for the relevant aspects to be considered when decisions are made on implementing integrated care.

When a MAST-IC evaluation is carried out, it is important to tailor the outcomes and outcome measures to the specific study and population. In addition, a detailed reporting guideline should be developed for the specific study / project in order to tailor the MAST-IC assessment to the requirements of the specific project. In addition, the reporting guideline should reflect how the results should be reported.

According to the original MAST manual [14], the framework can be used for different purposes. It can serve as:

1) a basis to design new studies of the outcomes of ICT supported integrated care services;

2) a checklist to include the proper domains, outcomes and indicators in new studies of ICT supported integrated care services; and

3) a framework for an assessment based on existing literature reviews, studies and information on the specific ICT supported integrated care service.

A.1.3 The elements of MAST-IC

Based on the experiences from the three European projects SmartCare [5], BeyondSilos [6] and CareWell [7], and the results of the Delphi process and literature review, the MAST framework has been adapted to ICT supported integrated care; MAST-IC includes the following domains as shown in Table 3 below:

Table 3: Domains in MAST-IC

Domain number	Integrated care
1	Health and social situation of the citizen and characteristics of the service
2	Safety
3	Clinical and care aspects
4	Citizens' perspectives
5	Economic aspects
6	Organisational aspects
7	Socio-cultural, ethical and legal aspects

Each domain represents the viewpoints of both health, social, and informal care perceived not as separate silos, but as one service provider.

In line with the original MAST, MAST-IC includes the following steps:

- **Step 1:** Preceding considerations of a number of issues to be considered before an assessment of ICT supported integrated care is initiated, e.g. maturity.

- **Step 2:** A multidisciplinary assessment of the outcomes of ICT supported integrated care within seven domains:
  - Domain 1: Health and social situation of the citizen and characteristics of the service.
  - Domain 2: Safety.
  - Domain 3: Clinical and care aspects.
  - Domain 4: Citizens' perspectives.
  - Domain 5: Economic aspects.
  - Domain 6: Organisational aspects.
  - Domain 7: Socio-cultural ethical and legal aspects.

- **Step 3:** An assessment of the transferability of results found in the scientific literature and results from new studies.

A.2   Step 1 - Preceding considerations

Before the outcomes of an integrated care service are assessed, it is important that a number of preceding considerations are made in order to determine whether it is relevant to carry out the assessment at this point in time.

First it is important to determine the aim of the service and relevant alternatives with which the service must be compared in the assessment.

The description of the aim of the service should include a description of the citizens in question, their health and social situation / needs, and the aim of using the service and ICT. Thus, first should be described how the ICT supported integrated care service is expected to be an improvement compared to other services and technologies used for the same target population.

The following aspects should be considered:

- Purpose of the service:
  - Why should the service be implemented and what is the benefit?

- Relevant alternatives:
  - Are there any alternatives to the service?
  - Why is this particular service an improvement compared to other services available?

- Organisational impact
  - Are the organisations affected ready to engage in the changes needed?

- Legislation:
  - How does ICT supported integrated care service fit into the existing legislation and regulatory frameworks?
  - Are all legal aspects in terms of permits in place incl. data sharing and data security?

- Reimbursement:
  - o How is the service reimbursed in the involved organisations?
- Maturity and timing:
  - o How mature is the service?
  - o How does the service fit in the existing organisational set-up?
- Number of citizens:
  - o What is the relevant number of citizens expected to use and benefit from the service?

A.3   Step 2 - The domains in MAST-IC

In accordance with the results from the Delphi process and the literature review, the existing MAST domains and topics have been confirmed to be valuable for integrated care assessments. Some elements have been modified and adapted to fit MAST-IC. However, relevant parts from the original MAST manual have been transferred to this manual.

A.3.1   Domain 1: Health and social situation of the citizen and characteristics of the service

Domain 1 should include a description of the health and social situation including the needs of the citizens in the targeted population, and a description of the characteristics of the service being tested to support the citizens' situation and meet their needs. The current local context in which the new service is being deployed should also be described.

This domain should provide the decision makers with solid background information including a description of the service, the ICT solutions that are available, the need for training resources, and the division of responsibility between organisations and carers involved in the provision of care.

The topics within this domain include a description of the epidemiology of the targeted condition(s) (both health and social), and the burden for the individual citizen and on society as a whole caused by them. A description of the regulatory status of the integrated care service and the requirements for its use should also be included. The description of the current status of the service provides a baseline description which is a useful starting point for further parts of the assessment, and serves as a comparison for assessing potential improvements in the service.

As the framework is adapted to assess ICT supported integrated care, the technical characteristics of the ICT should be described. This includes issues such as the need for a common infrastructure covering all involved organisations, and the need for interoperability. Interoperability refers to the integration needs with regards to other clinical or administrative systems such as electronic care records, administrative systems, clinical databases, social care systems, other applications etc. The assessment must also include a description of the need for user support, help desk functions and back-up systems and procedures.

Note that ICT supporting integrated care reflects complex interventions involving many stakeholders and participants. The detailed description of the service and the technical characteristics in this domain are therefore an important part of the full description of the service being assessed that will benefit other institutions considering using the service.

Topics

The following topics can be included in the assessment of the health and social situation and needs of the citizens, and the characteristics of the service:

- Description of the local context.

- Health and social situation of the citizen.

- Description of the citizens' needs.

- Description of the service.

- Technical characteristics.

Definition	This domain includes a description of the health and social situation of the citizens expected to use and benefit from the ICT supported integrated care service. In addition, it includes a description of the service and the ICT solution being assessed. The content of this domain serves as a description of the background for the further assessment.
Topics	• Description of the local context. • Health and social situation. • Description of the citizens' needs. • Description of the service. • Technical characteristics.
Transferability issues	Are demography and characteristics of the citizens' condition similar?
Examples of methods for data collection	• Systematic literature review. • Analysis of register data. • Local and regional statistics for health and social situations. • Interviews with care providers and manufacturers. • Mapping of technical infrastructure.
Examples of descriptive characteristics for description of the local context	• Description of the local context where the service is implemented. • Relationship between the involved organisations and carers.
Examples of descriptive characteristics for health and social situation	• Definition of target condition. • Symptoms, consequences. • Number of citizens. • Burden of condition, resource use. • Current management of condition. • Existing quality standards. • Relations to other conditions or treatments. • Change in citizen segments (will the service increase or decrease the group of citizens who can benefit from or will be offered the service)
Examples of descriptive characteristics for description of the citizens' needs	• The reason for deploying the service. • Description of the citizen's needs specified, divided into met and unmet needs.

Examples of descriptive characteristics for description of the service	• Features of the service. • Tools required to use the service. • Training and information needed to use the service (care providers, citizens and informal carers). • Maturity of the service (life cycle). • Division of responsibility for the ICT solution between involved organisations. • Regulatory status. • Market situation.
Examples of descriptive characteristics for technical characteristics	• Infrastructure requirements. • Interoperability: Integration needs (devices, with current applications, e.g. electronic patient records, technical standards, etc.). • Technical support. • Technical environment. • Standard situation. • User support. • Back-up systems and procedures.

A.3.2   Domain 2: Safety

Safety is defined as the identification and assessment of harms related to the use of ICT supported integrated care services. Safety should be divided into a description of potential harms, and an assessment of the actual harms identified in the intervention period. ICT supported integrated care issues of safety are divided into care related safety and technical safety.

Care related safety includes the assessment of potential harms inflicted on the citizen using the service. This description should include the type of harms, their incidence, and their severity. This may cover aspects such as adverse events caused by failures of communication between the different care providers, safety issues related to using multiple types of medication provided by different care givers, or information record accuracy.

Technical safety includes issues related to the technical reliability of the service, including an assessment of backup, interference and security of data. It may also cover aspects such as information gaps between organisations and/or care givers, and system errors.

Note that care related safety and technical safety are highly interlinked. As an example, problems with the technical reliability of the service may result in wrong decisions made by the carers which could harm the citizen. However, in the presentation of data collected on safety, it can be practical to divide the data into information about care related safety and information about more technical issues.

Topics

The following topics can be included in the assessment of safety:

- Care related safety (citizens and care providers).
- Technical safety (technical reliability).

Definition	Safety is the identification and assessment of harms.
Topics	• Care related safety (citizens and care providers). • Technical safety (technical reliability).

Transferability issues	Is the assessment of safety transferable to another organisation or cross-border?
Examples of methods for data collection	• Analysis of register data and databases. • Interviews and questionnaires. • Examination of log files.
Examples of outcome measures and descriptive characteristics for care related safety	Potential harms: • Potential direct or indirect harms when using the ICT supported integrated care service. • What can be done to minimise the harms? • Estimates of incidence of harms. Actual harms: • Direct or indirect harms occurred during the assessment period, divided into types of harms (e.g. mortality, morbidity, disability, and medication errors). • When did the harms occur? • Frequency of the harms. • Duration of the harms? • Severity of the harms (mild, moderate, severe or life threatening). • Actions to eliminate or minimise harms.

Examples of descriptive characteristics for technical safety	• Is there a backup system and how does it work?
	• What does the Service Level Agreements (SLA) cover?
	• Technical interferences in the ICT solution and related consequences.
	• How is the safety compared to alternative solutions?
	• Level of data security (data privacy) and quality of data management:
	    ○ encryption / cryptography;
	    ○ data storage.
	• Data ownership.

A.3.3 Domain 3: Clinical and care aspects

The assessment of clinical and care aspects depends on the condition and situation of the citizens being assessed.

The outcome measures should be selected based on which topics and issues are considered relevant to assess. When assessing integrated care involving both health and social care providers, it is important not only to measure health related outcomes, but to include social outcomes as well. For example, in the literature on integrated care interventions, different aspects of quality of life appear, which is not only restricted to health related quality of life; other aspects include: life satisfaction, mood, mental health related quality of life, and loneliness. Another example is the measurement of use of care, which should be considered to include all relevant care services, e.g. admission to nursing homes, use of home care services, hospitalisations and re-admission to hospital, etc.

In MAST-IC, use of care services can be used both as an indicator for the health and wellbeing status of the citizen, but also as an indicator when estimating the economic outcome of care (see below).

It is sensible to use validated outcome measures wherever these are appropriate and available, as they can facilitate comparisons between the findings of different studies.

However, suitable validated instruments are not always available. When reporting outcomes, general guidelines for reporting scientific results should be followed.

Topics

The following topics can be included in the assessment of the clinical and care aspects:

- Use of care services, e.g. number of contacts with care providers divided into type of contact.
- Effect on care, e.g. disease management, waiting time for medication, social dependency, social functioning.
- Effects on mortality:
  - o Condition specific mortality or overall mortality.
- Effects on morbidity:
  - o Condition specific morbidity or overall morbidity.
- Effects on quality of life or general wellbeing:
  - o Both generic and condition specific.
- Behavioural outcomes, e.g. lifestyle changes.

Definition	When defining clinical and care aspects, it is important to include measures relevant for each sector / organisation involved in the provision of care (e.g. both health and social outcomes).
Topics	- Utilisation of care services (e.g. number of contacts with care providers divided into type of contact). - Effect on care (e.g. disease management, waiting time for medication, social dependency, social functioning). - Effects on mortality. - o Condition specific mortality or overall mortality. - Effects on morbidity. - o Condition specific morbidity or overall morbidity. - Effects on quality of life or general well-being. - o Both generic and condition specific. - Behavioural outcomes (e.g. lifestyle changes).
Transferability issues	Can results be transferred to other populations? External validity.
Examples of methods for data collection	Systematic literature review. RCT, Cluster RCT, Controlled studies, observational studies, register based studies, clinical databases.

Examples of outcome measures for utilisation of care services	Health care: • Hospitalisation (type and number). • Length of hospital stay. • Reduced number of days spent in hospital. • Re-hospitalisation including time between admissions. • Contacts with health care providers divided into type and number (e.g. visit to GPs, emergency departments, outpatient visits, home health care and tele consultations). Social services: • Allocated home help. • Admission to nursing homes (permanent or temporary). • Referred to community services at discharge. • Use of home care and community based services. • Contacts to social care providers (type and number). • Home care visits.
Effect on care	• Effectiveness of care. • Disease management (team work incl. informal carers). • Quality of home environment. • Waiting time for medication. • Social dependency. • Social functioning. • Social needs.
Examples of outcome measures for mortality	• Death. • Place of death (home/hospital).
Examples of outcome measures for morbidity*	• Post hospital infections. • Frailty. • Functional status. • Management of condition (e.g. pain management, medication management).
Examples of outcome measures for quality of life or general well-being	• Interference with quality of life. • Depression. • Mood. • Anxiety. • Changes in social relations. • Isolation. • Concentration. • Quality of life. • Life satisfaction. • Mental health related quality of life. • Loneliness. • Self-esteem. • Personal resources. • Coping. • Emotional functioning. • Cognitive function. • Psycho-social functioning.
Examples of outcome measures for behavioural outcomes	• Risk behaviour. • Behavioural changes. • Life style (e.g. weight loss, smoking). • Treatment plan compliance. • Medication compliance.

*For examples of disease specific outcome measures please consult the original MAST manual [14].

A.3.4 Domain 4: Citizen perspectives

Citizens' perspectives address the ICT supported integrated care intervention from the citizens' point of view, and includes issues related to the perception of and satisfaction with the care.

The citizens' perception and satisfaction with care is an important aspect because integrated care to a larger degree involves citizens and their relatives. ICT solutions are often used as a tool to include the citizens in the communication loop and support their ability to handle their own condition, e.g. in patient-centred care. Therefore, ICT supported integrated care can be expected to affect the citizen's perception of the overall care process.

Relevant measures of the citizen perspective in relation to ICT supported integrated care include: the effect on the citizens' belief in their ability to handle their condition, and the impact of the condition, i.e. measures of self-efficacy. Similarly, empowerment can be an important measure when assessing the ability of an individual to be an active participant in the management of his/her condition.

If citizens are actively involved in the use of the ICT solution, their acceptance, ability and confidence in using the ICT solution should be assessed. This can be done by the inclusion of questions in questionnaires to the citizens. However, it should also be considered to ask citizens who are unwilling to participate why this was the case.

Introduction of ICT supported integrated care can have large effects on how and to what extent informal carers (i.e. relatives, volunteers) are involved in helping and caring for the citizens. Their perspective can be described as a separate topic, or if relevant, included in the topics of the citizens' perspective, depending on the type and degree of involvement in the care.

Topics

The following topics can be included in the assessment of citizens' perspectives on integrated care services:

- Satisfaction and acceptance.
- Understanding of information.
- Confidence (in the care).
- Ability to use the ICT solution.
- Access and accessibility.
- Empowerment, self-efficacy.
- Informal carers' perspective.

Definition	Citizens' perspectives address the ICT supported integrated care intervention from the citizens' and informal carers' point of view, and include issues related to the perception and satisfaction with the care.

Topics	- Satisfaction and acceptance. - Understanding of information. - Confidence (in the care). - Ability to use the ICT solution. - Access and accessibility. - Empowerment, self-efficacy. - Informal carers' perspective.
Transferability issues	- External validity: Can results be transferred to other populations? - Cultural differences, differences between subgroups.
Examples of methods for data collection	- Surveys. - Questionnaires. - Interviews: - Focus group interview. - Telephone interview.
Examples of outcome measures for satisfaction and acceptance	- Satisfaction and attitudes towards care providers (e.g. nurses, physicians, social workers). - Professional–citizen interaction. - Satisfaction with responsiveness of care providers. - Satisfaction with communication and information between citizen and care provider. - Satisfaction with discharge arrangement and preparation. - Satisfaction with coordinated care. - Satisfaction with treatment or services. - Satisfaction with own involvement in care plan. - Unmet needs. - Privacy/confidentiality.
Examples of outcome measures for understanding of information	- Citizen education / training. - Number of questions asked to professionals. - Perception of communication with professionals. - Disease and lifestyle knowledge. - Recall of information.
Examples of outcome measures for confidence (in the care)*	- Confidence with own care plan. - Uncertainty.
Examples of outcome measures for ability to use the ICT solution*	- Technical literacy. - Level of experience with technical solutions.
Examples of outcome measures for access and accessibility	- Perception of access to services (e.g. health or social services). - Timeliness. - Convenience.
Examples of outcome measures for empowerment, self-efficacy*	- Measurements of self-efficacy. - Measurements of empowerment.

Examples of outcome measures for informal carers' perspective	• Psychological distress. • Satisfaction with care. • Confidence in care. • Satisfaction with resources available. • Family functioning. • Informal carer's knowledge of citizen's condition.

* For examples of other outcome measures please consult the original MAST manual [14].

A.3.5 Domain 5: Economic aspects

Since the general costs of care are increasing, the need to prioritise the limited resources is growing, which is why the assessment of economic aspects of integrated care services is important.

This is relevant at a societal level, but also within the specific care organisations which must decide whether or not to implement new services.

In the economic domain, the use of resources related to the implementation of the integrated care service should be assessed for each care professional, informal carer, relative and citizen. A business case should be produced which should take all relevant care organisations into consideration to cover the full continuum of care. This is particularly important, as increasing the use of home care may increase the social care costs, while reducing healthcare costs by more than this. I.e., there may be a societal gain, but organisational losses.

Topics

The following topics can be included in the assessment of the economic aspects of integrated care services:

- Economic evaluation (societal perspective).
  - Amounts of resources used when delivering the assessed integrated care service and its comparators in the care sectors.
- Business case (institutional level).

Definition	The economic aspects of an ICT supported integrated care service can be described in: • A societal economic evaluation comparing an integrated care service with other relevant alternatives in terms of both their costs and consequences. • An analysis of the expenditures and revenues for the care organisations using the integrated care service. The total cost of the intervention should be described as a result of this domain.
Topics	• Economic evaluation (societal perspective). Amounts of resources used when delivering the assessed integrated care service and its comparators in the care sectors. • Business case (institutional level).

Transferability issues	- External validity: Are the conditions during the study realistic in practice? - Cost function: To what extent does the cost per citizen vary with number of citizens? - Economic consequences for different regions.
Examples of methods for data collection	- Systematic literature review. - RCT, cluster RCT. - Controlled trials, cohort studies. - Observational studies. - Statistical analysis of register or database data.
Examples of outcome measures for economic evaluation	- Use of services: - The citizen's number of contacts with care providers and cost per contact (both health and social services). - Types of resources (intervention/programme costs): - Use of care providers (for each of the relevant type of care providers). - Medication and laboratory tests. - Citizens' use of time (incl. time missed at work). - Relatives' use of time (incl. time missed at work). - Informal carers' use of time. - Investments in equipment. - Training of care providers. - Maintenance. - Transportation. - Unit costs or prices for each resource used: - Cost of home care services / visits. - Cost of community services. - Cost of hospital / specialist services (including admissions and re-admissions). - Cost of GP services. - Cost of long term services including long term follow up. - Related changes in use of care resources: - Primary care. - Home care. - Emergency unit. - Outpatient visits. - Hospitalisation. - Bed days. - Tertiary care.
Examples of outcome measures for the business case	The business case should cover all involved organisations to reflect the integration between care providers: - Expenditures per year (including expenditures related to the resource use described in the cost estimation above). - Revenue per year: - Activity (number of citizens or services). - Reimbursement (e.g. DRG-rate) per service or citizen. - Cost savings due to implementation of the service.

A.3.6 Domain 6: Organisational aspects

The organisational domain considers what kind of resources have to be mobilised and organised when implementing a new service, and what kind of changes or consequences this can have for the organisation.

ICT supported integrated care may cause extensive organisational changes in structural, cultural and social aspects of the organisation, e.g. new working routines, changes in the distribution of tasks and work load between professions and care providers. Therefore, the organisational aspects should play a significant role in the assessment; an important question to be asked is how the new service will fit within the existing organisational framework.

When describing integrated care services, it is also important to consider the degree of interoperability and the influence on the use of resources (part of the economic domain).

The care providers are important in a successful implementation of new integrated care services. Therefore, the perception of the care providers should also be included in the organisational assessment, e.g. perception of the service, level of satisfaction, and perception of the impact of the service.

A starting point for an analysis of organisational changes in processes could be a mapping of the current work flow and contact points between the care providers and the citizen.

Even though this framework aims at suggesting outcomes which can be isolated and measured with a reasonable effort, descriptions of the various processes and the organisational relationships often include a description of relationships and diagrams rather than statistical measures.

Topics

The following topics can be included in the assessment of the organisational aspects of an integrated care service:

- Process.
- Structure.
- Culture.
- Management.

Definition	The organisational domain considers what kind of resources have to be mobilised and organised when implementing a new service, and what kind of changes or consequences the use can further produce in the organisation. In an integrated care context, the organisational aspect must be considered both on an inter-organisational level (between organisations) and intra-organisational level (within organisations).
Topics	- Process. - Structure. - Culture. - Management.
Transferability issues	- Can results be transferred to other organisations? - Can results be transferred to other populations? - Mapping pathways into the community – transfer beyond the health and social systems. - Barriers and facilitators.

Examples of methods for data collection	The relevant methods for data collection may include both qualitative and quantitative methods:
	• Qualitative methods:
	   o Interviews.
	   o Focus group interviews.
	   o Observations.
	• Quantitative methods:
	   o Surveys.
	   o Questionnaires.
	   o Registration of data.
	• Systematic literature reviews.

Examples of outcome measures for process	• Workflow and touch points between care providers:
	   o Changes in distribution of work (working hours spent) between the care providers involved (task shifting).
	• Care providers, training and resources:
	   o The care giver burden.
	• Informal carers, e.g. volunteer organisations:
	   o Consider anxiety and satisfaction of informal carers.
	• Interaction and communication:
	   o Information exchange between sectors, timeliness of the exchange and communication quality.

Examples of outcome measures for structure	• Spread of technology, including frequency of use of the service and level of integration. • Changes in the organisation of generalist and specialist tasks. • Changes in geographical spread. • Time spent on travel, care providers. • Time spent on travel, citizens.
Examples of outcome measures for culture	• Care providers' attitudes towards ICT supported integrated care. • Care providers' experience with the use of ICT supported integrated care. • Perception of quality of care by care providers. • Care provider satisfaction. • Utilisation of care providers' skills.
Examples of outcome measures for management	• Changes in managers' span of control (on all relevant levels). • Changes in leadership style. • Changes in directives, initiatives and resource accessibility set by management. • Political strategies and goals related to the integrated care service should be considered.

A.3.7 Domain 7: Socio-cultural, ethical and legal aspects

Socio-cultural aspects

The social-cultural topic in the domain focuses on more general implications, such as the diverse social-cultural arenas where the citizen lives and acts while using the service.

The following elements can be included in the assessment of the socio-cultural aspects of integrated care services:

- Changes in the citizen's role in major life areas, e.g. social life, working life.

- Relatives' and others' understanding of the ICT solution and integrated care service.

- Societal, political context and changes. Will the service influence the general model for the delivery of care, if deployed?

- Changes in responsibility. Are the citizens and/or relatives capable of handling the possible responsibility related to receiving the service?

- Gender issues. Does the service have any consequences on the position of gender?

Ethical aspects

Ethical values, moral principles and social rules (norms) form the basis of social life as well as national laws. These factors play a key role in shaping the context in which integrated care services are provided.

Within the assessment, the ethical analysis appraises the ethical questions raised by the service itself, and by the consequences of implementing / not implementing it.

The following elements can be included in the assessment of the ethical aspects of integrated care services:

- Challenges in relation to religion, cultural and/or moral beliefs.

- Potential ethical problems, e.g. giving responsibility to the citizens.

- Autonomy: Is the citizen's independence challenged or increased?

- Equity among different groups in society.

Legal aspects

This part focuses on the legal obligations which must be met, and identifies any specific legal barriers that may exist to the implementation of the service. An assessment should be carried out of the readiness of the existing legal framework to accommodate ICT supported integrated care. If changes are needed, these should be reported.

The legal analysis should identify the legal and regulatory questions raised by the service itself, and the consequences of implementing or not implementing it.

A significant part of the legal assessment will focus on issues of information governance. When ICT supported integrated care involves the processing of person identifiable data shared between different security settings, it is important to assess the information governance model operated by the care institutions. It should be ensured that they are suitably enabled to accept data from external stakeholders.

When ICT supported integrated care services use personal data, the citizen will in many cases have the right to know what data is collected, how it is stored, and who may have access to it. In many countries, citizens will also have the right to access the data themselves, and to require changes to be made to the data. The assessment should examine how far such rights will reach in relation to the service in question, and if they would cause any organisational issues.

In addition, aspects related to data security and data responsibility should be addressed.

The following elements can be included in the assessment of the legal aspects of integrated care services:

- Professional (clinical / social) accreditation.

- Information governance.

- Professional liability.

- Citizen control: consent, access.

- Data aspects including data security and data ownership.

Definition	The domain includes topics that identify the ethical, legal and socio-cultural aspects of the ICT supported integrated care service.
Topics	- Social issues. - Ethical issues. - Legal issues.
Transferability issues	- External validity: Cultural differences, legal differences, differences between subgroups. - Necessary legal basis. - Transferability across borders.
Examples of methods for data collection	- Systematic literature review: - New studies: - Surveys. - Questionnaire. - Focus group interview. - Legislative documents. - Interviews with key stakeholders. - Referral to ethics committees.
Examples of descriptive characteristics for ethical issues	- Challenges related to religious, cultural and/or moral beliefs. - Potential ethical problems, e.g. giving the responsibility to the citizens. - Autonomy: Is the citizen's independence challenged or increased? - Equity and equality in care.
Examples of descriptive characteristics for legal issues	- Clinical accreditation. - Information governance. - Professional liability including the division of responsibility and the need for special authorisation. - Citizen control – consent, access to data. - Data aspects including data security and data ownership.
Examples of descriptive characteristics for social issues	- Changes in the citizens' role in major life areas, e.g. social life, working life. - Citizens' relatives and others' understanding of the service. - Societal, political context and changes. Will the service influence the general model for the delivery of care if deployed? - Changes in responsibility. Are the citizens and/or relatives capable of handling the responsibility? - Gender issues. Does the service have any consequences on the position of gender?

A.4   Step 3 - Assessment of transferability

Assessments of ICT supported integrated care interventions should include considerations of whether the results can be generalised from one setting to another. This consideration should be made within each of the seven domains. A transferability assessment should include considerations regarding whether results can be transferred across borders, to different demographic settings or care groups. This should include whether differences in legislation, reimbursement or organisation of the care sectors makes transferring the

results impossible. In addition, possibilities of transferring results from economic evaluations from one setting to another should be addressed.

For further discussions on transferability please consult the original MAST manual (14).

Appendix B: References

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