



MasterMind

## Deliverable D7.7

*Final guidelines and pathways for  
video conference for  
collaborative care and treatment  
of depression*

### **MASTERMIND**

“MANagement of mental health  
diSorders Through advancEd  
technology and seRvices –  
telehealth for the MIND”

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This deliverable shows the final guidelines and pathways for videoconference for collaborative care and treatment of depression. We present a literature review of depression as a health problem, e-health, computerised cognitive behavioural therapy, collaborative care and implementation. The pathways show the relevant patient pathways in the project, both from the pilots and as general pathways.

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## **Executive Summary**

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This deliverable shows the final guidelines and pathways for videoconference for collaborative care and treatment of depression. We present a literature review of depression as a health problem, e-health, computerised cognitive behavioural therapy, collaborative care and implementation. The pathways show the relevant patient pathways in the project, both from the pilots and as general pathways.

We present guidelines developed in the project based on the experiences of the pilots in MasterMind who have used video conference for collaborative care and/or treatment of depression. The guidelines cover organisation, documentation, reimbursement, support, training, technical issues, and other topics. The experiences from the pilots were collected with a questionnaire after the implementation period.

This guideline provides valuable information with respect to the implementation of videoconference for collaborative care and treatment of depression and the experiences of our project have added value for all the initiatives in this field.

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# 1. Introduction

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## 1.1 Purpose of this document

This document presents guidelines and pathways for using videoconference for collaborative care (ccVC) and treatment of depression.

## 1.2 Background

The MasterMind project has created guidelines and pathways for using videoconference for collaborative care (ccVC) and treatment of depression. These guidelines have been developed over the course of the project. The guidelines are based on the experiences of the MasterMind pilots. The original aim in MasterMind was to use VC in collaborative settings between GPs and specialists. During the development of the services, the usefulness and need for it in direct treatment and cCBT solutions was realised. This guideline is not the only way of implementation, but the experiences of our project have added value for all the initiatives in this field.

The guideline can be used by mental healthcare organisations, local therapists, GPs, or patients, who have ccVC possibilities. Mental healthcare organisations are the organisations that will actually implement the ccVC interventions in their routine practice. The ccVC service should be done in an organisation that already provides health services and has prior guidelines that are effective. As routine practice varies, the organisations may also vary from GP practices to large specialised care centres.

Mental healthcare organisations can be:

- Organisations of health and prevention.
- Psychiatric departments.
- Healthcare organisations (public healthcare providers).
- Mental health units.
- Health centres.
- E-health clinics.
- Local Health Authorities.
- Mental health outpatient services.
- Other.

Sometimes “consultation teams” are formed from these various professions, mostly to guide the work of GPs in complex cases.

To get the most useful information about the implementation of videoconference services, we classified the pilots into the following groups during the project, depending on their focus. Note that there was some overlap between groups, as some pilots wanted to implement several different solutions.

- Group A is collaborative care between specialist and GP without patient. The purpose of these meetings can be that the specialist guides the GP in use of cCBT, or that they together assess a patient's medication, or plan the treatment of a patient.
- Group B is collaborative care between specialist and GP where the patient can be present. The purpose of the meetings can be the same as for group A.
- Group C is follow-up or outpatient care of the patient at home. In this case, the healthcare worker communicates with the patient, who is at home. The healthcare worker can be either a GP or specialist, depending on the location. This can be as a follow-up to cCBT treatment.
- Group D is acute care. This is video conference from the acute ward to a specialist. Together with the patient, they make a plan for the patient, e.g. decide if admission is necessary. By reducing unnecessary admissions, we save both resources in the health care system and avoid an extra burden on the patient.

### 1.3 Glossary

<b>CBT</b>	Cognitive Behavioural Therapy
<b>cCBT</b>	Computerised Cognitive Behavioural Therapy
<b>ccVC</b>	Videoconference for Collaborative Care
<b>DALY</b>	Disability Adjusted Life Year
<b>GP</b>	General Practitioner
<b>ICT</b>	Information & Communication Technology
<b>VC</b>	Video Conference
<b>YLD</b>	Years Lived with Disability

## 2. Literature review

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### 2.1 Depression as a major public health problem

Depression is one of the most significant public health problems worldwide; each year, around 30 million European citizens suffer from unipolar depression (Wittchen et al., 2011). Unipolar depression is associated with a high disease burden and elevated economic and societal costs due to absenteeism, early retirement, loss of productivity, and premature death (Ferrari et al., 2013; Kessler, 2007). Major Depressive Disorder accounted for 8.2% (5.9%–10.8%) of global YLDs (Years Lived with Disability) (Ferrari et al., 2013); according to the World Health Organisation (WHO), depression is the largest single cause of disability worldwide, accounting for 11% of all years lived with disability globally (World Health Organisation, 2013). By 2020, depression is projected to reach second place worldwide in the ranking of Disability Adjusted Life Years (DALYs) calculated for all ages and both sexes (Murray & Lopez, 1997).

Annual estimated costs are 177 million Euro per 1 million inhabitants for major depression, and 147 million Euro per 1 million inhabitants for minor depression (Smit, Cuijpers, Oostenbrink, & Batelaan, 2006). In 2004, the cost of depression in the EU was estimated at 118 billion Euro, which corresponds to 253 €/inhabitant (Sobocki, Jönsson, Angst, & Rehnberg, 2006). Depression is associated with an approximately 50% increase in medical costs of chronic medical illness (Katon, 2003). In addition, depression is characterised by an early onset; it is associated with high chronicity, low quality of life, impaired social and personal relationships, disturbed academic and professional life, and a variety of physical health problems (Barney, Griffiths, Jorm, & Christensen, 2006; Titov, 2011). Depression is often comorbid with other chronic diseases (Chapman, Perry, & Strine, 2005), and patients affected by chronic illnesses have a higher risk of depression compared to the general population (Katon, 2003); it can also worsen their associated health outcomes. The prevalence of chronic medical illnesses was found to be 64.9% to 71.0% in depressed people (Wells, Rogers, Burnam, Greenfield, & Ware, 1991).

The sufficient diagnosis and treatment of depression have a major public health significance. The adverse impact of depression on individuals and society underline the need for the provision of effective psychological therapies. Nevertheless, the number of people who receive treatment for depressive disorders are considerably low (Andrews, Henderson, & Hall, 2001; Spijker, Bijl, De Graaf, & Nolen, 2001). It is estimated that around 56% of patients with major depression receive no treatment at all, despite the availability of effective treatments (Kohn, Saxena, Levav, & Saraceno, 2004). Among the barriers to psychotherapy are the high costs of participating in sessions with a professional psychotherapist, the stigma associated with participation in a psychological intervention, the limited number of trained clinicians, and the limited or lack of access to low threshold, low cost and evidence based psychotherapy and services in many countries (Barney et al., 2006; Titov, 2011). There are a lot of unmet needs concerning both psychotherapy and pharmacotherapy; the reasons behind under-treatment varies in each country (Kohn et al. 2004). Antidepressants are effective and are widely used treatment methods for depression, but patients may be reluctant to use antidepressant medication. Clinical guidelines for the treatment of depression recommend a “stepped-care” approach: lower intensity psychosocial interventions may be used to treat lower levels of depression (NICE Guideline, 2009: <https://www.nice.org.uk/guidance/CG90>).

The majority of persons with a mild or moderate depressive disorder receive treatment in primary care settings, mostly from GPs, by means of antidepressants, and less by brief psychotherapeutic interventions. Patients who seek help in primary care often do not disclose their psychological problems, such as bad mood and low energy (probably due to the fear of stigma). They report only their non-psychological symptoms (back pain, insomnia, weight loss, etc.). The partial disclosure of symptoms often leads to “quasi-therapy”: the patients receive painkillers for back pain, vitamins for fatigue, but lack appropriate treatment (Serna et al., 2010, Boenish et al., 2012). Rapid relief is not guaranteed by the treatment with antidepressants alone, as the medicines act relatively slowly (Meijer et al., 2004, Olsson et al., 2006, Serna et al., 2010). Patients suffering from more severe depressive disorders are often referred to specialised mental health care services, where treatment consists of medication, psychotherapy or a combination of both (Cuijpers et al., 2012; Cuijpers, van Straten, Andersson, & van Oppen, 2008b; Wittchen et al., 2011). For specialised care, there is an overall trend in Europe to replace inpatient by outpatient care in specialised mental health centres (deinstitutionalisation), and treat depression, if appropriate, in the community in primary care settings. However, the rates differ considerably among EU countries. On the other hand, governmental cost-saving measures adopted in several countries have included the reduction of budgets for mental health services with subsequent effects on service availability (Cooper, 2011). Given the decreasing availability of effective treatment services for depression, it is apparent that additional resources are urgently needed to offer support to both patients and healthcare professionals for the management of depression.

## 2.2 eHealth and its impact on psychiatric care: Telepsychiatry

‘eHealth’ refers to the use of electronic media in different healthcare settings. eHealth includes all Information Technology (IT) systems and programmes used by different healthcare organisations. The following media applications can be used in eHealth services: telephone, mobile phone, internet, email, videoconference (VC), web-cameras, etc. These communication methods can support a diverse range of healthcare activities: assessment and treatment, education and training, and administrative tasks (Richardson et al. 2009). Given the potential benefits of eHealth, there has been growing interest in its potential usefulness in mental health services, since it has the potential to combat the obstacle of access to mental health care services (Saleem et al, 2008):

- Improve service user access to treatment, especially in rural and difficult to access areas or for people with lower mobility.
- Reduce the need for practitioners and service users to travel in urban areas, thus avoiding issues with traffic and parking.
- Improve illness management, relapse prevention, and follow-up continuity.
- Shorten the waiting list time for specialised care.
- Save resources and increases cost-efficiency.

Telepsychiatry can be defined as “the delivery of healthcare and the exchange of health information for the purposes of providing psychiatric services across distances” (Wooton, Yellowless, McLaren, 2003). The growing number of eHealth technologies has reached mental health care services in the last two decades. Evidence-based studies have proven its efficacy in treating depression symptoms and anxiety disorders (Hilty et al. 2004) and psychotic disorders (Valdagno et al. 2014). Telepsychiatry does not substitute the

traditional face-to-face therapy, but supplements it. The most effective, modern e-psychiatry applies a blended care approach, which refers to the combination of face-to-face and online therapy methods (Purebl, Szabó-Tóth 2015).

## **2.3 Computerised cognitive behavioural therapy for depression**

In general, current interventions (i.e. treatments) for depression are designed to relieve symptoms, restore damaged and core functions, and prevent relapse. The most common evidence-based interventions are psychotherapy and pharmacotherapy. MasterMind focuses on psychotherapy, which can be in either a face-to-face format, contained in book format (bibliotherapy), or electronic format (internet-based treatment) with some kind of personal support from a therapist (Cuijpers et al., 2008b).

Cognitive Behavioural Therapy (CBT) is one of the most studied psychotherapies, and has been found to be an effective treatment for depressive symptoms. The basic assumption of CBT is that depression is perpetuated by maladaptive thoughts that can be modified to adaptive thoughts, and thus lead to changes in behaviour, which ultimately results in reduced depressive symptoms.

CBT consists of highly structured therapeutic sessions focusing on cognitive input and behavioural change. Therefore, CBT is ideally suited for ICT-based administration. For example, the instructions to reach therapy goals can be easily transmitted by technological means, including homework assignments (e.g. worksheets) for the patient.

Several Randomised Controlled Trials (RCT) and meta-analyses have examined the effectiveness of internet and other computerised CBT programmes for the reduction of depressive symptoms. The results so far have shown that Internet based CBT is effective in treating depressive complaints (Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010; Cuijpers, van Straten, & Andersson, 2008a; Gallego & Emmelkamp, 2012; Hedman et al., 2014; Spek et al., 2007; Warmerdam, van Straten, Twisk, Riper, & Cuijpers, 2008), especially when supported by a therapist (Andersson & Cuijpers, 2009), and even as effective or more effective than pharmacological treatments for certain populations (Cuijpers et al., 2012; Roshanaei Moghaddam et al., 2011). Pharmacological treatment combined with psychotherapy is suggested to yield even better effects in reducing the clinical burden of depression (Cuijpers, 2014). In a randomised controlled study, Meyer et al. (2015) found significant improvement in the depressive symptoms after three months follow-up among initially severely depressed patients undergoing an internet-based intervention without personal support. In another randomised controlled study, web-based CBT with short face-to-face therapist support alleviated depressive symptoms in primary care patients. Additionally, it had significant positive effects on anxiety symptoms and satisfaction with life; overall treatment satisfaction was also high in the intervention group (Hoifodt et al, 2013).

Studies on cost-effectiveness show that cCBT in depressed patients is a promising solution (Gerhards et al., 2010; Hollinghurst et al., 2010; Warmerdam, Smit, van Straten, Riper, & Cuijpers, 2010). Due to the fact that certain therapeutic elements of the therapy can be automated, the therapist can focus on those parts of the treatment that depend on the client-therapist intervention, and so treat more patients at the same time. Therefore, cCBT appears to be a promising approach in alleviating the burden of depression.

## **2.4 Collaborative care for depression facilitated by video conferencing**

According to the American Psychiatric Association, a Collaborative Care team is led by a primary care provider (PCP) and includes care managers, psychiatrists, and frequently other mental health professionals, all empowered to work at the top of their licence. The team implements a measurement-guided care plan based on evidence-based practice guidelines, and focuses particular attention on patients not meeting their clinical goals. The four essential elements of the model are<sup>1</sup>:

- Team-driven.
- Population-focused.
- Measurement-guided.
- Evidence-based.

Collaborative care is associated with significant improvement in for example depression and anxiety outcomes compared with usual care, and represents a useful addition to clinical pathways for adult patients with depression and anxiety (Archer et al., 2012). For MasterMind, collaborative care is to be understood as care consisting of a multi-professional approach to patient care, a structured management plan, scheduled patient follow-ups, and enhanced inter-professional communication (Gunn, Diggins, Hegarty, & Blashki, 2006).

The use of videoconference technologies in psychiatry has been shown to be a viable option for delivering mental healthcare to patients, in both inpatient and outpatient settings (Shore, 2013; Valdagno, Goracci, di Volo, & Fagiolini, 2014). Besides delivering specific treatments (e.g. anger management), previous research has demonstrated that using videoconferencing-facilitated mental healthcare services is satisfactory for patients, improves health outcomes, and might be cost effective (Richardson 2009 et al.). Ruskin et al. (2014) have found in a randomised controlled trial for US veterans treated by video-conference equipment, that the improvement of depressive symptoms, medication adherence and remission rates did not differ greatly compared to the control group with a face-to-face treatment (Ruskin et al, 2004). In another study, Poon et al. 2005 found significant improvement in cognitive abilities (attention and memory) of patients with more mild forms of dementia. The improvement was similar among the patients treated by VC and the control group (TAU). As the findings are very promising, there is also a need for awareness of the salient regulatory, administrative and clinical issues that may arise in the practice of modern telepsychiatry (Shore, 2013). Video calls can be made between practitioners, within the same healthcare provider, or in other organisations, and between practitioners and patients and/or carers. Video conferencing can be employed in the following processes (Yellowlees et al. 2010):

- assessments;
- therapeutic care;
- follow-up care, outpatient visits;
- medication management;
- psychotherapy and consultation.

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<sup>1</sup> <https://www.psychiatry.org/psychiatrists/practice/professional-interests/integrated-care/collaborative-care-model>

Collaborative care facilitated by videoconferencing has been shown to be as effective as, or more effective than, practice-based collaborative care for patients who screened positive for depression. Fortney et al. (2007) found that primary care clinics without an on-site psychiatrist can successfully apply telemedicine technologies. Similarly, research suggests that telemedicine-based collaborative care does not increase the total workload for primary care or mental health providers (Fortney, Maciejewski, Tripathi, Deen, & Pyne, 2011), so there is no disincentive for mental health providers to offer telemedicine-based collaborative care.

## 2.5 Implementation in routine practice

With these major achievements in mind, increasingly more emphasis and effort is put into testing and applying evidence-based interventions in real life pilots and care settings. Several good examples of successful implementation of evidence-based interventions in routine practice exist. However, it seems that implementation and up-scaling of evidence-based interventions often take place in research and pilot projects, and hence have a limited scale and effect in reducing the actual disease burden of mental disorders in daily practice (Barlow, Bullis, Comer, & Ametaj, 2013; Emmelkamp et al., 2013; Kazdin & Blase, 2011; McHugh & Barlow, 2010; 2012).

Reasons for the low uptake of evidence-based interventions by routine practice are still only partly understood. Suggestions differ, and include reasons such as that it might have to do with the strong comorbidity among psychological disorders requiring more complex treatment and care than ICT-based interventions might be able to offer, the (relative) insensitivities to interpersonal differences in patients, or the relative (in)applicability of knowledge obtained by nomothetic driven RCTs in relation to helping the personal patient characteristics, and the dodo bird interpretation of psychological therapies and limited therapist allegiance to clinical guidelines. The uptake and sustainability of evidence-based therapies in routine practice might be influenced by issues with the structure of the healthcare delivery system, including financial incentives and reimbursement systems, the lack of adequately trained professionals and workforce instability, professionals' attitudes towards innovation, and client perspectives on their health and care.

This problem of translating scientific knowledge into daily practice is not new, and is not limited to health sciences alone (see e.g. Rogers, 2003). However, a field of research has emerged that is continually advancing, and promises suggestions on how to change this situation. Endeavours in this field of Implementation Science range from theoretical explorations like the Normalisation Process Theory by May and Finch (May & Finch, 2009), to a magnitude of concepts, frameworks and models charting the factors influencing the dissemination and translation of knowledge to practice, such as the Greenhalgh and colleagues' model for diffusion of innovations in health service organisations (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004), and the Consolidated Framework for Implementation Research by (Damschroder et al., 2009), to more pragmatic approaches such as the MAST assessment framework developed by Kidholm and colleagues (Kidholm et al., 2012), and Glasgow's RE-AIM framework enabling the planning and evaluation of concrete implementation programmes in practice (Glasgow, Vogt, & Boles, 1999).

Taken together, the huge burden that depression places on people and societies, the availability of evidence-based and feasible interventions, and the novel insights brought forward in the field of Implementation Science, provide both the urgency and opportunity to conduct practice-oriented research on implementing and up-scaling evidence based

interventions in routine mental healthcare. With this in mind, the present study intends to provide insights into the aspects that might influence the uptake of computerised Cognitive Behavioural Therapy (cCBT) services by the mental healthcare community in 11 different European regions, and to provide the community with strategies for implementing cCBT in different healthcare contexts.

## **3. Pathways for collaborative services**

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In this chapter, we address the design of VC solutions, provide examples of pathways from the MasterMind pilots, and outline some general pathways for the services.

### **3.1 Design**

When designing the implementation of a VC solution, it is important to design the proper way of the process. There are different key stakeholders, healthcare professionals, decision makers, GPs, organisations to be contacted, and different ways of collaborating. In order to create the best design for the implementation, the key stakeholders must be contacted to gather their needs and possibilities.

- The final design (guidelines and recommendations) should be clear and agreed on by the professionals who implement them; involve professionals in the development of the guidelines.
- The design should be developed and agreed on by all the stakeholders involved, and not in a top-down approach; professionals should participate in the co-design of services.
- Three key perspectives that must be taken into account when developing the design:
  - Governance -> Organisational support.
  - Clinical perspective -> Fit with the organisation strategy.
  - Technological aspects -> Integration with legacy systems and support structure.

Here are some examples on how to get in contact with key stakeholders and professionals:

- Project presentation to general managers of integrated care organisations; they can contact potential GPs; organise several work sessions to discuss service design with healthcare professionals (GPs and specialists).
- Conduct meetings with department heads (psychiatrist and primary care); visit centres to review implementation possibilities in situ; interview healthcare professionals and administration.
- Ask for feedback from professionals involved.
- Prior analysis of needs and requirements.
- Focus groups, interviews with healthcare professionals and decision makers.

It is possible to communicate with the stakeholders through different channels:

- Oral communication with all stakeholders.
- Written communication with all stakeholders.
- Workshops and meetings with stakeholders.
- Social media.
- Visual communication: the use of multimedia solutions to present via video or MP4 formats.

Organising the cooperation:

- Treatment:
  - There should be guidelines for when and in what situations the new technical solutions should be used.
  - The use of VC between specialists and GPs requires agreements between the hospital and GP offices about when and how these meetings should be held.
  - The psychiatrists and primary care physicians should schedule a common agenda in the framework of collaborative care to discuss the various issues and cases.
  - The ccVC service should be integrated into the routine workflow to increase the quality of the service, but paying attention not to introduce any significant changes, but maintain the current clinical practices as much as possible.
  - Clinicians, both GPs and specialists, can use the ccVC tool when necessary, on request, giving usability and flexibility to collaborative care.
- Scheduling the sessions:
  - Organise monthly ccVC sessions at each centre.
  - Include the time of the slot reserved for the videoconference in the professionals' diary as a kind of appointment.
  - Follow the treatment plan with the sessions.
  - Because of the use of ccVC, some specific schedules could be created for the specialists, allocating specific slots in their daily routine. GPs should be able to book these slots.
  - Example: the clinical teams takes part in a one-hour videoconference once a month. They discuss the progress of the patients they have in common, and they make joint decisions about their care plan and follow-up, which is mainly performed by the primary care professionals with Mental Health Unit professionals support provided in these sessions.

## 3.2 Pathways

The pathways of patients depend on the local health system. The following are examples from the MasterMind project. They can give a hint concerning how to plan the local pathways:

- The psychiatric department receives referrals from local health care centres.
- Patients are referred for depression treatment by their GP. Video conferencing is used in the cCBT treatment for patients who cannot reach the outpatient clinic easily, e.g.: rural area; mothers with young children who do not have babysitters; patients who cannot afford travel costs; patients with disabilities.
- The patient attends an appointment with a member of the Mental Health Crisis Resolution Home Treatment Team (CRHTT); if an assessment with the consultant psychiatrist is required, then a video conferencing appointment is set up. Patient remains with member of CRHTT, and psychiatrist is at another health board site.
- Patient recruitment and management is operated by the patient management team of each specific clinic. For final inclusion, the patient needs a referral from his GP or medical specialist (psychiatrist or neurologist).

- It is also used for follow-up continuity and relapse prevention. The patients receive a group introduction to the online platform during their stay at the clinic; after they have been released, they are offered up to 25 sessions with an online therapist. The online therapist might be the same as the in-patient therapist, but not necessarily.
- Patient has option of face-to-face or VC appointments; if VC, then a pre-treatment questionnaire is filled out and signed, then the patient meets with therapist.

### 3.3 Video conference from GP to specialist in elective care

This is the case where the GP and specialist communicate over VC, with (Group B) or without (Group A) the patient. This is a planned meeting or treatment, where the GP is at his/her office. Since this involves a multi-professional approach, it is a good starting point for setting up collaborative care.

The purpose of these meeting can be direct treatment of the patient, in which the specialist guides the GP concerning the use of cCBT, or in which they jointly assess a patient's medication or plan the treatment of a patient.

When the GP has consultations with the patient, the specialist can also join via video conference as an advisor. If only the GP and specialist communicate, they will have to decide when it is useful for them to use VC, and when it is easier to use the phone.



**Figure 1: Elective video conference between GP and specialist**

The outcomes of the treatment can be continued care at the GP without VC guidance, transfer to polyclinic, possibly with a waiting list at first, or cessation of treatment (see Figure 1).

Benefits for patients:

- Avoid unnecessary travel.
- Receive better treatment or advice from a more well-informed GP.
- Increased patient empowerment.
- Decreased stigma of psychiatric treatment.

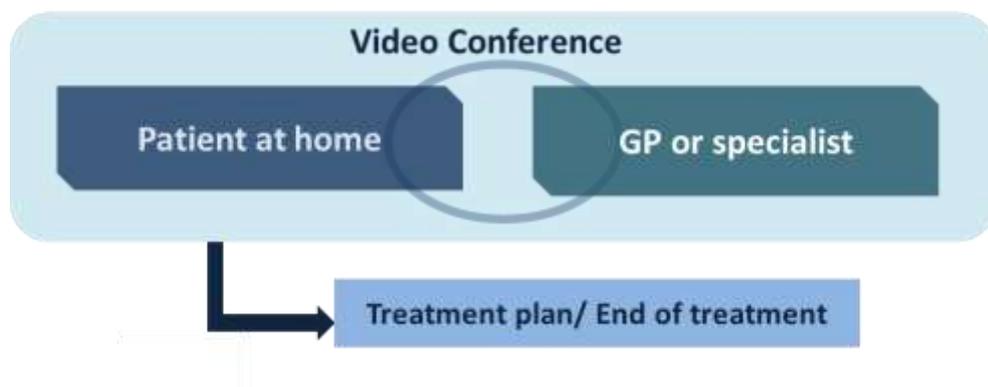
Benefits for healthcare staff and service:

- Use in collaborative care to analyse and discuss the handling of complex cases, ask questions or solve specific clinical questions, and increase the decision-making capacity of the GPs.
- Aid the GPs in psychiatry in general practice, and reduce the number of referrals.
- Supporting GPs in using cCBT solutions.
- GP learns while discussing cases with specialist.
- Better care through collaborative care.
- Healthcare professionals have the opportunity to discuss various issues with the psychiatrist, for example if the healthcare professional required a second opinion on a patient or had a medication query.

### 3.4 Video conference from healthcare worker to patient at home

In this case, the healthcare worker communicates with the patient, who is at home (Group C). The healthcare worker can be either a GP or specialist, depending on the location.

In this setup, the patient will be communicating with only one level of the healthcare service, but it is possible to have elements of collaborative care for discussions or guidance of the health care worker.



**Figure 2: Video conference between patient and health care worker**

Possible outcomes for this are: making a treatment plan, or end of treatment.

Benefits for patients:

- Receives treatment or follow-up at home.
- Saves time by not having to travel.

Benefits for healthcare staff and service:

- Can provide treatment or follow-up to patients over a distance, while still having a “clinical eye” on the patient.
- Travel time and travel costs can be saved.

**Treatment:**

- The treatment has to be organised by the local protocols, needs and possibilities.
- Examples:
  - The treatment starts and ends with a face-to-face session, and the online video sessions (if indicated) are in between to replace one or more face-to-face sessions. The duration of the VC sessions will conform to regular treatment sessions: 30-45 minutes (on average). The number of face-to-face sessions versus videoconference sessions may differ depending on the needs of the patient.
  - Within the outpatient treatment, video-conferencing (VC) is offered to patients after patient inclusion and an introduction to the online platform in a face-to-face group session with the clinic's IT specialist. The online therapist gets in contact with the patient directly (this first contact often takes place on the telephone) and sets a date for the first VC session. From then on, the patient can receive 25 sessions of VC, enriched with cCBT elements on the platform. The therapist offers two sessions a week during the first eight weeks of treatment, and then for the following eight weeks one session per week, plus one booster-session after the end of treatment. The treatment delivered via VC is best described as evidence-based CBT for depression, for which a modular therapy manual has been written to account for the use of cCBT in this setting. The treatment contains modules on psychoeducation, activation, modules on emotion and cognition, as well as relapse prevention.
  - Relapse prevention treatment: The treatment is structured into two main phases: first, 12 sessions of relapse prevention, and then 12 sessions of modularised CBT plus one booster session after the end of treatment. In phase 1, the patient is offered support in finding an out-patient therapist close to his or her home. The online therapist would support a possible transfer to an outpatient therapist. If this is the case, a VC consultation between the online therapist and the outpatient therapist is recommended.

### **3.5 Video conference from GP to specialist in acute care**

Many acute admissions to psychiatric wards come from the emergency wards (Group D). A possible reason for this is that the GP and the patient, their family, or local officials are in a situation where the problem is that no contingency plan perceived as secure can be obtained. If the specialist healthcare system is perceived as a secure "back up", often the situation can be defused.

In this case, we recommend a video conference from the acute ward to a specialist. Together with the patient, they make a plan for the patient, e.g. decide if admission is necessary. By reducing unnecessary admissions, we save both resources in the healthcare system, and avoid an extra burden on the patient.



**Figure 3: Acute video conference between GP and specialist**

As shown in Figure 3, the result of the video conference can be that the patient is admitted to specialist healthcare, or the patient receives further treatment at the GP, possibly with VC guidance from the specialist, as described in section 3.3.

Benefits for patients:

- Avoid unnecessary and potentially stressful travel to specialist clinic.
- Gain access to specialist services.

Benefits for healthcare staff and service:

- GP learns while discussing cases with specialist.
- Save resources by not having to transport and care for patients more than necessary.

## 4. Guidelines for collaborative services

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This chapter describes guidelines for implementing collaborative care services for depression treatment, with examples from the pilots in MasterMind.

### 4.1 Before starting the VC service

#### 4.1.1 Organisational guidelines

Introducing new technical solutions in an organisation will require changes in the organisation. There are several issues that have to be addressed. Involve healthcare professionals and decision makers to ensure that the implementation is designed in line with the needs of the healthcare system: patients, professionals, and organisations.

#### 4.1.2 Legal issues

The implementation should include legal and security experts, who can identify and apply relevant guidelines, legislation, and regulations. Security experts should also perform an information security risk assessment, to identify risks to confidentiality / privacy, integrity, and availability. This will ensure that legal and security challenges are identified as early as possible, and can be dealt with.

Clarifying roles and responsibility of care can also be challenge. If a patient receives collaborative care by video conference with a GP and a specialist, is the specialist considered an advisor or a therapist? It needs to be made clear what roles the different partners have, and who is responsible for the advice and treatment given.

Sometimes legislation prohibits distance treatment if it is only distance treatment.

Patient data:

- The sharing of any patient data, clinical history files, and examination results, should be in line and in accordance with legal and organisational rules and data security requirements.
- The professionals involved in the process should be “privacy aware”, that is retaining knowledge about appropriate practice when it comes to privacy and security behaviours. This can be achieved through training, education, and developing a privacy aware organisation.
- The main issue is having a technical solution for video conferencing that is considered secure for exchange of patient information. Consider server-to-server authentication, role-based access control, and centralised storage of configuration data. Measures must be taken for each level applications; low level would focus on the identification and authentication of users accessing the system.
- There can be concerns with regards to the network security if the laptop is connected to a patient’s home Wi-Fi or broadband, outside of the secure own network; a solution can be using VC within the organisation only, however it narrows the usability of the tool.

- Recordings of different communications events made through the platform are considered subject to high level security, and require other measures specified by law.
- Examples:
  - Patient data are shared with the Electronic Health Record, which is accessible through all healthcare levels.
  - The patient data is shared in the local informative system accessible by GPs, psychiatrists, and psychologists.
  - Professionals participating in videoconferencing have access to various systems of patient information.

### 4.1.3 Reimbursement

Health authorities or insurance companies usually pay mental healthcare organisations for their services. It must be clarified how this is treated when care is provided by video conferencing. Which partner receives reimbursement?

Examples (organisations):

- The health department signs a contract with the providers and allocates a budget from taxes.
- Being part of a National Health Service (NHS), there are no charges for the services, therefore no reimbursement would have been received from patients for any service area or department.
- Health insurance companies cover consultation. The reimbursement is the same as for F2F sessions.
- GP reimbursements go to the GPs themselves. If the municipality hires the GP, the municipality receives the reimbursement, from either National Health Service or the health insurance companies, etc.. This is the same for face-to-face and video sessions.

### 4.1.4 Technical issues

A comprehensive technical guideline for implementing video conferencing in general, “Video Conferencing – Infrastructure, Technology and Support”, is included as Appendix B. This provides a detailed description of technical requirements and challenges for using video conferencing. Some of the topics covered are the needs for infrastructure, security challenges, compatibility challenges, as well as room requirements. However, if there is an own guideline, then we recommend using it. Additionally, there are some issues to consider:

- If possible, adopt widely used tools (e.g. Gotomeeting, Skype for business, etc.) rather than less efficient local solutions.
- Video conference can either be used with PC-based clients, or dedicated video conference units. VC also requires a stable and fast Internet connection.
- Dedicate rooms and equipment completely to the ccVC service only. Rooms where patients will participate in video conferences should ideally be furnished as conversation rooms, and not as traditional meeting rooms. This will help create an

atmosphere where the patient can be at ease. Both the therapist and patient must be in an area where patient information cannot be overheard.



**Figure 4: Room for patient conversations in Silsand, Norway**

### Practical issues

- Lighting: What are the circumstances of daylight / lighting? Does the room have curtains?
- Are there web cam available for both parties?
- Noise and sound: Is there background noise? An echo? Can we hear each other - sort out sound settings.
- Are there rooms and equipment available? Do I have a phone, if I get delayed who can I call?
- Security follow-up (PCs cannot be taken away from the healthcare facilities).
- Are the following available: remote desktop display, document sharing, instant messaging, whiteboard?
- Which corporate real time communication system to use? E.g.:
  - OpenMeetings (<http://openmeetings.apache.org/>); or another unified communication and collaboration software platform.
  - Easymeeting™: management of interactive meetings to a customised number of participants; Easymeeting™ provides a suite of work-collaboration tools such as screen sharing for documents and applications, whiteboard, recording, instant messenger, mouse pointer, PPT managing, real time polling, web-based scheduling.
- One example of security issues that have been taken into account: Users who access the system are corporate users, called to meetings through their corporate email. Users will access through a link that the system sends to them, in order to engage for a particular meeting. Only authorised users can manage calls. Video conferencing sessions held in the Intranet positions of the professionals.

### Technical considerations:

- During the sessions, it is crucial to avoid technical problems. It is very important to guarantee the appropriate bandwidth, otherwise the connection can be disturbed or broken in the middle of the session. Connection (broadband) should be minimum 4 Mbps bandwidth for both upload and download. (Wi-Fi is normally not good enough for VC)
- The technological applications should be integrated with the existing Information systems, i.e. the recording of information should use the same tool as for a face-to-face consultations.
- Sessions should or should not be recordable?
- Software (Internet Explorer 9 or newer, FireFox, Safari or Chrome), (Windows 7 or 10 or iOS version 9 or higher); preferably the device is not older than five years.
- Compatibility challenges: with every update of an operating system (Windows or iOS) or browser (IE, Chrome), it is possible that compatibility issues can arise.
- The installation procedure of the desktop and mobile application may be unclear and sometimes difficult for patients and therapists. There can be many different technical problems and it takes time to find out what the problem is exactly. It has to be decided if the patient uses his or her own equipment, or should the health care service provide equipment? It can be resource-demanding to find out if several patients' network connections are suitable for VC. In addition, if something fails technically on the patient's side, it can be hard to provide technical support.

It is necessary for the therapist to have a back-up plan (e.g. using the phone) to establish a connection with the patient when the VC connection fails. The therapist should discuss this beforehand with the patient.

### 4.1.5 Technical Support

It must be decided who is responsible to give support for the new solutions, and how the users (patients, therapists, and healthcare professionals) can get in touch with them.

- Operation and support are among the main challenges in using video conferencing. Even if good local procedures are in place to keep information and communication technology (ICT) up-to-date and running smoothly, challenges soon appear when the organisation starts using the technology for collaboration across boundaries with systems in other organisations.
- When telemedicine is introduced, the ICT departments and future support staff must be involved in both implementing the service and planning how to run it.
- A typical mistake is to assume that this is in place. One assumes that technical staff will automatically take care of introducing new technology. This applies in some cases, but not all. This issue must be clarified carefully and in detail during the preparation phase.
- Video conferencing generates several additional technical challenges in the network, such as security and network load. Increased needs for support must also be expected. Parts of the infrastructure and the systems in the network may already be adapted to a specific system. All these factors influence the choice of system and the way it should be run.
- Technical support must be immediate (face-to-face or telephone).

### **4.1.6 Training**

Map the needs for training.

The privacy component should be part of the training.

Plan the training for mental health professionals and GPs to use the new communication tool. The GPs' workload (case-load) and large number of patients can be a problem in implementing new tools and protocols. Some healthcare professionals are unfamiliar with these kinds of services; additional and flexible individual training for them should be planned and organised:

- Create online guidelines.
- Short training videos.
- Prepare downloadable manual for both therapists and patients, both long and short versions are recommended.

It can cause resistance from the patient's side to involve one more person in the psychotherapy; the professionals should be prepared and trained to handle this issue.

The importance of the professional's appearance on the screen during the communication with the patient should be shown. Training should be provided in how to appear and act on screen, and how this influences the communication with the patient.

If possible, patients should be trained while at a clinic; an ICT staff member can do the introduction to the system, and patients are invited to bring their own computer.

Training with credit points as part of Continuing Medical Education (CME) or Continuing Professional Development (CPD) for all health professionals can be more motivating.

ICT support through therapist.

- Patients should be able to call the therapist to solve problems with logging on, etc. The therapist also should have support available.
- Downloading the tool and handling updates can be complicated for patients; the therapist should be able to handle this problem.
- Examples:
  - Training can be centrally coordinated by the internal training department if it exists, containing eHealth and cCBT, ccVC components. The ICT and therapeutic parts should be separated.

## **4.2 Operational aspects, holding a VC session**

### **4.2.1 Participant enrolment**

It is key to find the right way to enrol participants into the system. During the enrolment process, there must be clear inclusion and exclusion criteria in order to avoid mistreatment.

There are two types of participants who have to be recruited: patients, and therapists.

**Patients**

In essence, the referral and recruitment procedures should follow routine practice. However, there are some special conditions to be used as criteria in ccVC services. The inclusion and exclusion criteria listed below are only possibilities based on the experiences of the MasterMind pilots with depressive patients. These criteria are not a "must", but we suggest considering them. The applicable criteria must be defined by the targeted clients, the local protocol, and the experiences of the professionals involved in the process.

**Inclusion criteria:**

- Define the minimum / maximum age of the participants.
- Computer literacy.
- Internet access at home. But depending on the design, other solutions can be acceptable, e.g. GPs office.
- Clear definition of diagnoses.
- Physical ability to use intervention or complete the relevant questionnaires, if any.
- Connection / belonging to the specific healthcare unit connected to the service.

**Exclusion criteria**

- History of psychotic symptoms or schizophrenia.
- Bipolar disorder.
- Dementia.
- Severe personality disorders.
- Dissociative disorders.
- Drug-related abuse or dependence disorder (except those involving nicotine), no later than six months before treatment.
- Difficulties in communication or other cognitive problems.
- Existence of relevant psychiatric or medically relevant comorbidity.
- Observed worsening during treatment.
- Appearance of suicide risk during treatment.
- Increase in the demand for care.
- Severe psychosocial stress.

**Therapists, professionals**

Therapists include mental healthcare professionals who are trained to provide patients with psychotherapy. In our study, therapists varied from GPs to mental healthcare specialists. However, it mostly depends on the local specification.

The ccVC system can be used for GPs who are not trained to provide psychotherapy as a liaison system where they can contact the specialist in case of a mentally ill patient.

The professionals can be one of the following:

- Psychiatrists (specialist).
- GPs.
- Psychologists (specialist).
- Mental healthcare nurses.
- Primary care professionals from primary care centres (GPs and nurses).
- Psychiatric nurses.

#### **4.2.2 VC session: Communication style and interaction**

GPs and specialists should be aware of the potential impact of the videoconferencing setting on their communication style and interaction pattern with the patient.

It is hard to synchronise between participants; sessions should be scheduled in advance.

Supply practical tips (best practice from earlier experiences), such as schedule the sessions during the first time slot in the morning (instead of later; danger of de-synchronisation) and schedule them on a regular basis (instead of non-periodic appointments).

Information must be handled in time; a typical problem is the lack of access to shared information during the sessions.

#### **4.2.3 VC session: Introduction**

As in face-to-face medical examinations, all persons present in the room and taking part in the videoconference session should be identified and introduced to each other.

An introduction about depression with local and general epidemiological data and information on their social impact is important.

#### **4.2.4 VC session: Documentation**

Appropriate documentation and reporting of the videoconference should be provided to all participants according to legal and organisational rules, and data security requirements.

Sessions can be documented in a patient journal and accessible in digital patient files at the clinic system the same way as face-to-face sessions. In addition to that, the sessions can be recorded and added to the documentation; they can also be available to the patient.

Information to be documented: depressive symptoms, diagnostic criteria, depression scales, and basic treatment of depression.

#### **4.2.5 Medication**

Consultation with GP and specialist (including patients or not) regarding antidepressant treatment should be documented, and a clear procedure should be established on the respective prescription (place, person in charge: GP or specialist, if applicable changes from initial to follow-up prescriptions).

Specific case management can be performed for each patient, including medication and follow-up.

#### **4.2.6 Psychiatric emergencies**

It is recommended to follow the local standard operating procedure established in the respective organisation regarding psychiatric emergencies (e.g. acute suicide risk), and (if applicable) modify them accordingly, e.g. regarding administrative issues such as a further clarification of roles and responsibilities in emergency situations, provision of around-the-clock back-up and emergency coverage, as well as 24/7 telephone lines.

The patient should be provided with an individual emergency plan within the programme.

Suggested criteria for referral: severity of symptoms, suicidal risk, and social emergency.

#### **4.2.7 Control and security**

Videoconferencing may produce a perception of control and distance evaluation different from face-to-face appointments; this is especially relevant for patients. Therefore GPs and specialists providing videoconferencing should be aware of safety issues.

Therapists should be aware of safety issues, and should evaluate whether VC is the best treatment method for each patient.

Periodic revision of protocol and alarm monitoring criteria is recommended.

## Appendix A: References

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## Appendix B: Technical guideline

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### Guideline

# *Video Conferencing - Infrastructure, Technology and Support*

## **MASTERMIND**

“MANagement of mental health  
diSorders Through advancEd  
technology and seRvices –  
telehealth for the MIND”

GA no. 621000

## Introduction

For many organisations, video conferencing (VC) equipment for use in meetings, teamwork and teaching is an investment that will save time and money in the long term. VC can also enable access to information and resources that would otherwise be difficult to reach.

A prerequisite for a good VC studio and a system that functions well for users is skilful installation and proper maintenance. Users of the studio must also have received training in how to use it, or have access to someone who can operate the system.

In the Norwegian public health service, video conferencing has been used for many years, with the emergence of many excellent studios that are widely used. In this article, NST would like to share information about the experience we have gained during more than 10 years of use and organisation of VC services for health care. We discuss both technical and organisational aspects.

## Practical advice for the use of VC

Communicating on video conference can be new experience for many users. Here are some practical advice:

- All participants should be identified during a video conference. The camera should be panned from one end of the room to the other. If there is a need for additional personnel to be in the room, the patient should be asked for permission.
- Zoom the camera to show all participants, but keep it as zoomed in as possible to make the participants seems closer.
- Make sure the light in the room is good enough that all participants can be seen clearly.
- One part of a video conference can mute their microphone to reduce the background noise. However, during patient consultations this is probably not advisable.

## Scope

Today, many alternative technologies are available for setting up a video conference. Some of the reasons for this are:

- Competition and market forces
- Acquisition of technology between large companies
- Development in the processing power of computer systems
- New compression standards
- The widespread distribution and development of tablet computers, smartphones and smart TVs
- Infrastructure improvements and expansion, increasing the available bandwidth
- Integration of VC clients in browsers and other software

- Growing use of streaming and cloud services in general
- Choices limited by the existing intranet services integrated in the organisation

After many years of video conferencing, people are still debating what the standard and the best choice for the future would be.

The aspects we describe here relate to VC systems with their own hardware, using the communication standard SIP/H.323 over IP.

Much of the information provided here will also be relevant to other VC, because many of the principles apply to all types of systems. Examples of other systems include software clients for computers (such as Skype, FaceTime, Microsoft Lync, Cisco Jabber) or other installations such as large auditorium systems or personal desktop systems.

### Prerequisites

VC is an advanced collaboration tool. The technical aspects must function properly, but they are only part of what it takes to use VC effectively. Some very important organisational factors must be in place:

- **Demand:** The people in the organisations that plan to work together must see the need – and must have a genuine need – to use VC as a tool in their work. The same applies to the people on the other side of the interaction.
- **Opportunity:** Time during working hours must be assigned for VC (simultaneously) for all the parties involved. This requires good planning and the establishment of best practices.
- **Training and practice:** VC systems offer a wide range of functions. To take advantage of the potential, training and practice is needed, especially for those who use the systems very rarely.
- **Support:** VC systems that fail are complicated and time consuming to fix. Technical support people, who can operate the systems, must be available.

If any of these elements is overlooked, collaboration using VC will not function well. Unfortunately, this situation is common because all these elements demand considerable resources. Gaining some benefit from VC as a tool for teamwork may then depend on good luck or on people who are especially enthusiastic about its possibilities. Perhaps this is one of the main reasons that video conferencing has not ‘taken off’ in every organisation, and that results and experience vary so widely.

### Operations and support

Operation and support are among the main challenges in telemedicine. Even if good local procedures are in place to keep information and communication technology (ICT) up to date and running smoothly, challenges soon appear when the organisation starts using the technology for collaboration across boundaries with systems in other organisations.

When telemedicine is introduced, the ICT departments and future support staff must therefore be involved both in implementing the service and in planning how to run it.

A typical mistake is to assume that this is in place. One assumes that technical staff will automatically take care of introducing new technology. This applies in some cases, but not all. This issue must be clarified in detail.

Video conferencing generates several additional technical challenges in the network, such as security and network load. Increased needs for support must also be expected. Parts of the infrastructure and the systems in the network may already be adapted to a specific system. All these factors influence the choice of system and the way it should be run.

### Lifetime

Video conferencing can be regarded as something between an audio/video product and a computer, because it combines these technologies. Both technologies are developing rapidly, with significant changes, improvements and price changes every month.

This means that a VC unit ages quickly. After about 4 to 7 years, a studio will be so old that it will have problems connecting to a new studio. Keeping the firmware up to date will however increase the service life.

### Other investments

Large H.323 / SIP-based VC systems are often linked with services that enable greater benefits from the VC unit. These may include functions for multipoint connections, recording, or registration of the system so that it is assigned an SIP address to enable easy calling from other H.323 / SIP-based VC systems.

These services are usually leased, because owning this infrastructure demands large investments. An organisation planning to install VC services must decide whether it wants to incur this cost. VC system providers can usually offer such services. H.323 studios can contact each other directly via IP addresses, without any other services, but this is currently not a common set-up.

## Infrastructure

The quality of the infrastructure with which the video conference communicates has a direct effect on the quality experienced during the video conference. If the line is not good, it is impossible to achieve good quality in video conferencing. Video conferencing is in a unique position with regard to requirements for the infrastructure. Hardly any other technology sets more demanding requirements for computer networks.

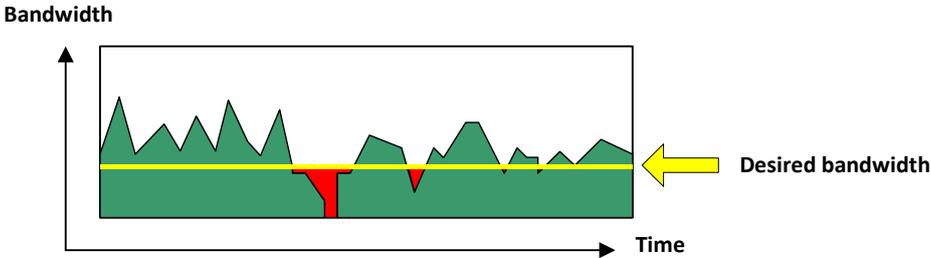
For projects in medicine, this situation often leads to a paradox. Settings with the greatest need for video conferencing often have a poor infrastructure. Technically, there is no easy solution for this: If the infrastructure is inadequate, video conferencing is impossible, and one must focus on other good telemedicine services instead.

It is very important to check the technical infrastructure before starting to plan a video conferencing service. Even if other data streams over the network work well, or the ISP (Internet Service Provider) offers a bandwidth guarantee, there is no guarantee of high quality for video conferencing.

The reasons for this are very complicated, as described below.

## Stability of the connection

In computer networks, the available bandwidth often varies depending on how much other traffic there happens to be at any time. There may be brief delays/breaks in the connection as well. We do not usually notice these things when we send an email or browse the Web. For video conferencing, it is different.



In video conferencing the tolerance for breaks or varying bandwidth is much lower. This is because you cannot buffer data (as you can when you watch a video recording online). You do not have time to retransmit corrupted data because in real-time communication you cannot wait for data. The figure below shows the problem of varying bandwidth, where the red areas indicate a loss of video conferencing data because of quality problems and/or breaks in the connection.

If the connection stability is poor, you will thus experience quality problems or lose the connection even though the average bandwidth is good. For wireless networks such as Wi-Fi or mobile networks, this problem will be greater because random obstacles can affect the radio-based connection, especially if the VC unit is mobile such as a tablet, mobile phone or laptop

## Quality of Service

What the Internet lacks is Quality of Service (QoS) – quality assurance of the connection. With QoS, you would know what the quality of the connection would be before you linked up. When the Internet was created, network equipment had too little data capacity to allow QoS. The Internet therefore has no control over the quality of the connection; you have to do the best you can with the resources available at the moment.



This means that statistical measurements over time are still the only indicator of the quality one can expect. No matter how good the technician is, it will be impossible for him/her to guarantee the quality. A simple test or two provides no guarantee of the same result during an important conference.

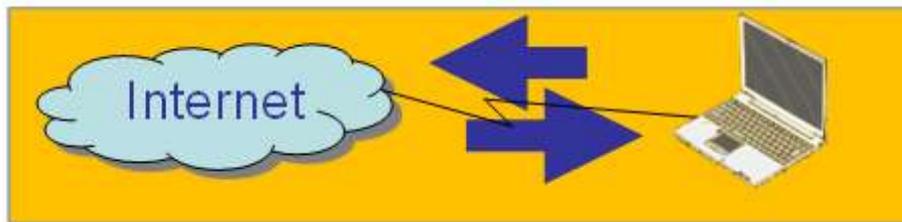
The Internet is thus a rather unreliable channel for transferring large quantities of real-time data, which is communication that cannot be cached, delayed or re-transmitted if a fault occurs.

The better the infrastructure, the less this unreliability will be, but it increases in line with the volume of data to be transferred. As the resolution of images has increased, the volume of data has grown correspondingly. For this reason, the unreliability of the connection is much the same as it used to be, but the difference is that when everything works properly, the quality of the images is much better. The alternative to the uncertain quality of the Internet is to have a local network where you can control the quality. In Norway, we have the Norwegian Healthnet, which gives us this opportunity.

### Connection speed

In everyday conversation (and in advertising), the speed of the data connection usually refers to the download speed. This is the speed you get when you download a video or a file from the Internet. For normal surfing on the Web, this is the most important parameter, because one usually sends only small quantities of data up to the network (search terms, clicking a link, etc.). Many networks are therefore designed to provide high download capacity, but low upload speed. Such networks are termed 'asymmetrical'. An example is ADSL.

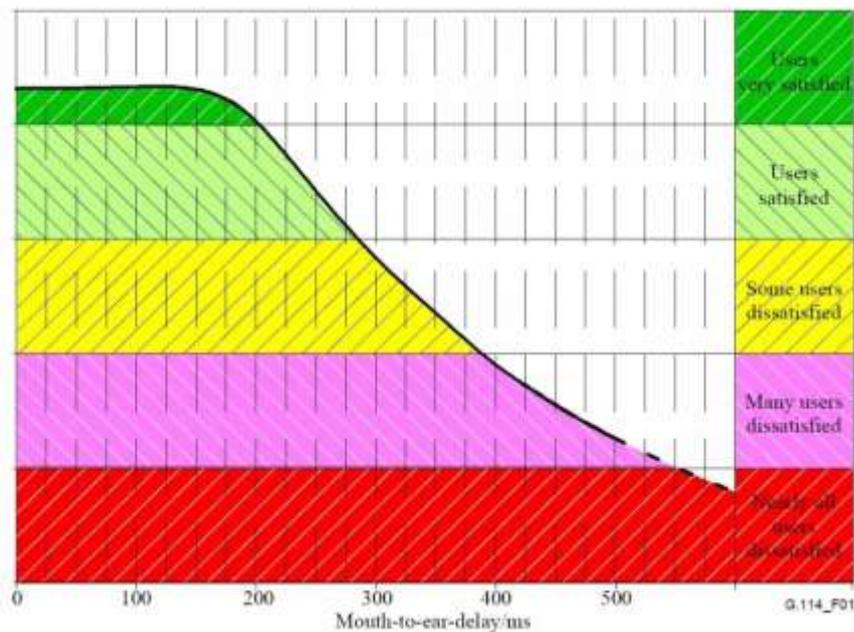
Again, communication between VC systems is an exception, because in this context the volume of data to upload is just as large as the volume received. This means that you need to check the upload speed in particular.



### Delay

In some cases, the bandwidth and stability are fine, but all the data take a long time to travel through the network. This can happen in many kinds of networks, but it is especially familiar from satellite transmission. You can see and hear this if you follow a satellite transmission on TV. After a question has been asked, it takes a long time for the reporter to reply. With a connection like this, it is difficult to have a normal conversation.

The International Telecommunication Union (ITU) has published a recommendation (ITU G.114 ) that evaluates the effect of a delay between the time that something is said and the time it is heard:



We see that with a delay of about 200 ms, the user experience starts to decline steeply.

A satellite connection has a minimum delay of about 240 ms. This means that there is very little tolerance for other delays in the network before the user experience becomes poorer. The Internet provides access to remote areas, but a satellite connection is poorly suited to video conferencing, because the delay is about 240 ms in the best case.

### Firewalls

Firewalls are set up to filter data, and have rules for the type of data and the ports in the network that can be opened. For an H.323 video conferencing system, several ports in the network must be open, which weakens the network security. In some enterprise networks, special procedures are needed for video conferencing systems to make it possible for VC communication to flow freely in the network and to/from the Internet.

Incorrectly configured firewalls or corrupt firewalls can produce very strange results in a video conference. A dialogue may function well with some systems, but problems may occur with others. You may find that you have two-way audio, but only receive video from one side. Tests such as ping or Web access may work, while connection of a conversation is not possible. Connection via other systems, such as a network bridge, may make it possible to work around the problem, but may also provoke new problems because the firewall reacts in a different way.

So the systems are not 'plug and play', and it takes an extra effort to get them to work. This barrier can be very time consuming to overcome and can demand a huge effort from the people responsible for ICT.



In many cases, people choose to set up systems outside the ordinary enterprise network, which may be a good alternative if one does not have advanced integration with other systems. In Norwegian health care, we often have the opportunity to use the Norwegian Healthnet video network, which is designed especially for video communication.

### Security

An advanced collaboration tool such as a VC unit puts information security on the agenda very quickly. A number of aspects, both technical and non-technical, present challenges to security.

We will look at the most common questions, but we recommend conducting a risk assessment to identify threats, impacts and measures in the service you are planning.

**Eavesdropping.** It is very unlikely that anyone will be able to eavesdrop on a conversation between video conferencing units by hacking into the computer network. The reason is that infiltration of conversations depends on targeted network access to network devices or video conferencing units. Some people have regarded this as a serious threat, however, and automatic strong encryption of the conversation is therefore available for most large video conferencing systems.

**Automatic answer (auto-answer).** A VC system can answer an incoming call automatically without anyone being present, if it is set up to do this. The advantage of this is that even if meeting participants on the other side are delayed, you still get an answer. The disadvantage is that no one checks who sets up the conversation.

**Strong password.** Remote administration is possible for VC units in the same way as for many other types of network equipment. This can be carried out using a Web interface or via other protocols such as SSH (Secure Shell). If you have logged into the VC unit using these methods, you can potentially gain full control over the VC unit, both to set up a conversation and to configure the system. It is therefore very important to set a strong password for access to network administration, especially if the VC unit is on the open Internet. This is one of the points that has often been neglected, because people have simply kept the default password and thus left the unit open to everyone on the Internet.

**The monitor and sound are switched off, but the VC unit is operational.** In some VC installations, it is possible to switch off only the monitor and the sound. The VC unit may then be in a conversation, but you cannot see or hear it. This is especially risky if auto-answer is on as well.

**Recording equipment may be active.** If one of the studios included in the conference has recording equipment, everything can be recorded. This may take place without all or some

of the participants being aware of it. For example, if someone forgot to switch off recording from the previous conference.

## Compatibility

### Other technologies

Today, H.323 VC is not very compatible with other video/audio products. Integration is however available with some systems, such as Microsoft Lync, but this requires advanced and targeted adaptation of network and computer systems. Skype, for example, is not compatible with H.323 VC.

### Between brands and models

H.323 is a standard that defines how communication should take place in technical terms. Unfortunately, it turns out that different types and brands of VC are not necessarily 100 per cent compatible with each other. The reasons for this *may* be:

- Random errors (bugs) in software on the VC unit.
- Disagreement about or different interpretations of the standard.
- Functions that are not standardised.

Combinations that increase the risk:

- New equipment is connected to old equipment.
- The unit has old software or different software from the system it is connected to.
- You use advanced functions across brands. These may include sending two video streams simultaneously, or having an encrypted conversation.

In our experience, these problems have become less frequent in recent years and ordinary, simple use of VC usually functions smoothly, but there is no 100 per cent guarantee. Problems can result in:

- Unexplained breaks in the connection.
- Unexplained quality issues for the image/sound
- Functions that do not work.
- The VC unit hangs and must be restarted.

If you know in advance which studio you will be connecting to most of the time, it may be an advantage to choose the same brand of equipment, if possible. If you choose another brand, or there is already a mixture, the new equipment should be tested together with the other equipment before it is purchased. If problems arise, this may mean that you need to choose something else, or that upgrades of the other studios will be needed. These may include simple measures such as a software upgrade of the VC unit.

## Functions and options

The larger VC units usually have several options that can be selected, even within the same model. Some of the options require additional equipment, while others are locked features that you have to pay extra to unlock. These functions vary depending on the brand and model. Some examples:

- Functionality for transmission of the image on the PC screen
- Extra bandwidth/speed
- Ability to display images on two monitors
- Extra quality of the camera
- Ability to connect up multipoint conferences directly from the VC unit
- Possibility to use ISDN lines

In addition, some suppliers offer additional services such as:

- Software upgrades
- Service agreements that include support
- Service agreements covering faults in the unit

Most options and additional services can be unlocked if you pay for them, so that you can install or order them later if it turns out that you need them, but it is still a good idea to check this for the unit you are thinking of buying. There may be great differences in the price of a unit that does not have additional services or options activated and one that has many.

As a minimum, we recommend checking that you have an agreement in place for software upgrades. Some brands include this when you buy the unit, while others have it as an option. With software upgrades, you will have fewer problems in connecting to other studios that you may want to call occasionally, and you can gain new functions or small adjustments that improve the VC user experience.

## Additional equipment and integration with other equipment

Larger VC units enable connection to other equipment such as PCs, VCR or document camera. For these systems, you can usually connect to any video source or audio source that complies with the normal standards. If you are not sure, you should still test this before purchasing the system.

In rooms in which the use of VC is combined with ordinary meeting activities, it is an advantage to be able to use such additional equipment independently of VC. For example, it is possible to use a VCR internally in the meeting room, using the VC unit's monitor as a TV screen. The advantage of this type of installation is that you can save costs by using the same equipment for several purposes.

One possibility is to use the VC equipment as a multimedia centre, in which all presentation of the meeting room's video and audio sources is controlled virtually exclusively by the VC equipment. This applies to both VC meetings and ordinary meetings. This type of use requires training in use of the VC equipment's functions such as source selection and image

layout, even if you just want to hold an internal meeting. For inexperienced users, this will be a barrier and obstacle that makes use of the meeting room cumbersome and dependent on particular individuals.

For combined-use rooms, we generally recommend that it should not be necessary to switch on the controls for VC equipment in order to get the meeting room's additional equipment to work in everyday use. Examples of areas of focus:

- External video sources: The signals should not have to go through VC equipment in order to appear on a screen or projector. Instead, these signals are split in advance, so that the projector and VC each receive their own signal.
- Sharing of projector/screen: In installations where the same projector/screen is used for both VC and normal PC connection, it is important that it is very clear how to switch between these two. When the projector is started up, it should be set up to choose the PC as the first choice.

### Prices

The price of H.323 VC varies widely. As an example, you can find free H.323 software for PCs, while the largest telepresence systems are far more expensive. Our impression is that the price usually ranges from € 5000 (desktop solutions) to € 40,000 (large meeting room). Additional equipment and installation cost extra.

Prices change fast, because new units are constantly appearing on the market. It will therefore only be possible to find up-to-date prices by contacting suppliers or issuing a call for tender.

The price that you end up with for your system therefore depends greatly on your technical requirements and the service agreements that you want.

### Requirements for rooms

To enable video conferencing in a meeting room, you need to take into account the position of the seats, lighting and sound. Here, we describe the most important factors to keep in mind.

#### Position of the camera

The camera must be placed close to the screen, so that you look into the camera when you look at the screen. Systems that are supplied with a monitor usually have the camera mounted above the monitor.

#### Projector

For rooms in which a projector is used to display images, the angle will often be too steep if you place the camera above or below the image. Our experience here is that the best solution is to place the camera on one of the sides of the image.

## Audio

VC involves both transmitting and receiving audio. This means that there may be challenges in relation to the speakers and microphones to achieve good quality.

## Speakers

Some VC systems are supplied with speakers. These are often placed in an accompanying rack or monitor. These systems usually have good sound.

If you already have an internal audio system, you will usually be able to connect VC to it. If you have a system without speakers included in the delivery, you can connect your VC to standard PC speakers, monitor speakers, amplifiers or other audio system.

Recent VC systems have stereo outputs, but sound is very often transmitted only in mono from other studios, so that you do not get a stereo effect on the receiving side.

## Microphone

### Table microphone

Most VC systems are supplied with one or more microphones that are placed on the table. These microphones generally work well, but have the disadvantage that it is easy for them to pick up the sound of rustling papers or a noisy laptop fan.

In some rooms, the microphone is moved away from the table when the VC system is not in use, to get the cables out of the way. A typical oversight is forgetting to put the microphone back in place before the next VC, causing a bad start to the VC meeting.

### Ceiling microphone

You can buy high-quality ceiling microphones that eliminate the problems of table microphones. The disadvantage is that a projector or ventilation system can cause problems with both installation and noise, which must be considered before ceiling microphones can be installed.

### Microphone for the presenter

Where one person is to deliver a presentation or lecture via VC, you will achieve the best results if the lecturer has his or her own microphone. If you have a set-up in which the lecturer can move around freely, a wireless clip microphone will provide the best possible result. The disadvantage is that you need to make sure that the wireless equipment has power.

### Positioning

The microphone cannot be positioned too close to the speakers. This might cause feedback. Most VC systems have functions to prevent this, but the sound quality will be drastically reduced. How close you can place microphones depends on the volume of the sound from the speakers and the sensitivity set for the microphones. There is therefore no hard and fast rule, but during the installation you need to test and adjust this.

### Lighting

Today, VC systems do not usually need extra lighting in addition to ordinary meeting room lighting. In certain rooms, however, getting the lighting right can still be a challenge. Some tips:

### Projector

The projector should be bright enough to make it unnecessary to dim the meeting room lighting to achieve good contrast. This is especially important if the projector is being used to display VC. If you dim the light too much, the VC camera may not manage to compensate for this.

### Sunlight

Sunlight shining through the window can ruin the VC image. You get less contrast in the image from a projector, for example. In addition, bright parts of the room will affect the light settings of the camera, so that the image you transmit has a mixture of normal and very dark areas. It is therefore important to have good blackout curtains so that you can control the light yourself even if there is sunshine.

### Indirect light

In some rooms, the light will fall in such a way that you get reflections from walls and tables. Most of the light thus comes directly from above. Here, you may find that people in the VC image have shadows under their eyes. You can improve this by moving the light source, or by installing lamps that light up the walls better.