Recommendations from sub-project 113 Saving lives together

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Summary

Background

In the spring of 2017, a national campaign was launched at the initiative of the Norwegian Directorate of Health, to increase survival and reduce permanent disability from time-critical emergency incidents. These are defined as cardiac arrest, stroke, heart attack and serious injuries. Sub-project 113 set out to develop recommendation for how the 113 centres (the Emergency Medical Communication Centres (EMCC)) can improve performance and interaction with callers for these patients.

Organisation

All the 113 centres were invited and participated with a representative in sub-project 113. 5 gatherings were held from May 2017 until January 2018. During this period, the 113 centres conducted a review of telephone recordings for cardiac arrest incidents and measured the time until cardiac arrest was identified and the commencement of CPR.

Results and recommendations

The time until commencement of CPR by the caller was reduced from 2 minutes and 45 seconds at the beginning of the project, to 2 minutes and 10 seconds by its conclusion. This is a theoretical increase in survival of 20 lives per year. The group believes that there is potential for a further reduction to under 2 minutes, including as a result of improved systems for locating the caller.

The project group has arrived at the following recommendations for how 113 should optimise its performance together with the caller in the event of time-critical incidents.

- Systematic reviews will be conducted of time-critical incidents in the 113 centres. For cardiac arrest, we recommend that all telephone recordings are reviewed, and that measurements of the time interval are conducted, combined with a debriefing of the 113 operator. Quality parameters are reported to relevant quality registries.
- For strokes, heart attacks and serious injuries, time intervals should be registered and a selection of telephone recordings reviewed, including all recordings that are coded as yellow priority by 113.
- All 113 operators should receive regular maintenance training, and should all participate in a minimum of 10 cardiac arrest incidents annually. Lack of exposure can be compensated for by simulation training.
- At all 113 centres, facilitators should be educated in order to conduct simulation training and debriefings.
- More must be done to raise awareness about 113 among the public, especially regarding their competence and possibilities for providing guidance to callers.

- Kokom (the National Centre on Emergency Communication in Health) should be assigned the task of continuing the work from sub-project 113 and ensure coordination of the improvement work across regional health authorities and centres.
- A network/advocacy group should be established for 113 personnel, that can facilitate professional development and transfer of experience, domestically and internationally.

Saving lives together

Saving lives together is as a national joint effort initiated by the Directorate of Health, in which various private, public and volunteer actors will work together to improve survival and reduce permanent disability for cardiac arrest and other time-critical out-of-hospital emergency incidents.[1] The campaign stems from NOU 2015:17 *First and foremost.*[2] The joint effort has established its own specialised council and has developed its own strategy document.[1]

The joint effort consists of several sub-projects. The objective of sub-project 113 is to optimise the interaction between callers and 113 (the Emergency Medical Communication Centres (EMCC)) for time-critical emergency medical conditions. The project is based on a literature review and the summaries from the project's consensus conference at Utstein Abbey on 21 February 2017. Other sub-projects will study opportunities for more efficient locating of the caller (AML technology), a 113 app and technological aids for the public and 113, a national cardiac arrest registry and public information regarding 113 on the website www.113.no and www.helsenorge.no.

In annex 1, a summary has been made of the main elements for how the 113 centres can improve interaction with the caller in time-critical conditions covered by the joint effort (cardiac arrest, stroke, heart attack and serious injuries).

Sub-project 113

Sub-project 113 was launched in May 2017 to improve the 113 centres' performance and contribute to increased survival in the event of time-critical out-of-hospital conditions.

From the strategy document, the following is cited as the mandate of the sub-project:

The sub-project shall:

- Identify measures for quick identification of time-critical emergency medical conditions
- Identify measures for effective guidance and assistance to the public
- Propose improved work processes in the 113 centres.
- Analyse the effects of new and amended work processes.
- Assess the effects of technological aids.
- Test methods for training and maintenance training.

Based on this knowledge, the project shall:

- Understand how amended work processes and technology can be introduced to the 113 centres.
- Propose functional and technical requirements for technological aids.
- Propose methods and indicators for measuring effects and impacts of the changes.

The results from the project will be incorporated into the national information strategy. Furthermore, information material is developed for:

- The country's 113 and local emergency medical communication centres.
- The emergency communication centres for the police and fire services.

Where the project identifies a need for introducing standardised requirements or amendments to applicable regulations, specific proposals for amendments will be developed.

All the country's 113 centres were invited to participate in sub-project 113, and are participating in the project. Furthermore, the sub-project includes participants from NAKOS (the Norwegian National Advisory Unit on Prehospital Emergency Medicine) and the Directorate of Health. The project has held five meetings in the period from May 2017 until January 2018. The measures have consisted of a systematic review of telephone recordings for cardiac arrest, definition and measuring of quality parameters (time intervals), and a review of telephone recordings together with 113 operators. The focus has been on learning and improvement. The project has also worked on developing recommendations for how the 113 centres should ensure quality of handling of time-critical out-of-hospital emergency medical incidents (cardiac arrest, stroke, heart attack and serious injuries).

Relevant provisions

Requirements for responsible conduct and the obligation to provide emergency health care are found in the Health Personnel Act Sections 4 and 7, and the Specialist Health Services Act Section 2-2.[3]

Minimum requirements for organisation and operation of the 113 centres are found in *Regulations regarding requirements for and organisation of municipal emergency primary care centres, ambulance services, emergency medical service communication system etc. (the Emergency Medicine Regulations)* Sections 14 and 15.[4]

Requirements for internal control and quality improvement in the health services are found in *Regulations regarding management and quality improvement in the health and care services.*[5] The regulations list a number of requirements for the services' control and quality systems, including requirements that:

- The services must have control systems that are adapted to the service's nature, activities and risk conditions.
- The services are obliged to evaluate their own service to ensure compliance with requirements in health and care services legislation, including requirements for professional responsibility and systematic work for quality improvement and patient and user safety.
- The services are obliged to review deviations, hereunder unwanted incidents, to prevent similar matters occurring.
- A systematic review and assessment of the entire control system in relation to available statistics and information regarding the service must be conducted minimum once annually to ensure that it functions as required and contributes to continuous improvement of the service.

The following is stated in the letter of commission to the regional health authorities for 2018:[6]

> *The following new documents shall form the basis for the development of the service:*
> - *Saving lives together – a national joint effort to save lives in the event of cardiac arrest and other out-of-hospital emergency medical conditions.*

The working group's assessments

The working group considers that the 113 centres is a socially critical service whose main task is to receive and handle communications regarding medical emergencies. Failures in this service may result in danger to life and health which suggests stricter requirements for internal control and quality assurance of the service.

The national first aid effort *Saving lives together* has defined four emergency medical conditions as time-critical. Here, time-critical means that the time from the onset of symptoms until life-

saving first aid measures and medical treatment are initiated will be critical for the outcome. The four conditions are:

- Cardiac arrest
- Stroke
- Serious injuries
- Heart attack

Early identification of cardiac arrest and telephone assisted CPR is considered to have great importance for survival in the event of out-of-hospital cardiac arrest.

Based on the review of telephone recordings from the country's 113 centres, it seems clear that there are considerable variations in time from the receipt of a distress call until the 113 operator identifies that the patient has had a cardiac arrest. The same applies to the time until CPR is administered under guidance from 113.

The project has identified several possible causes for the mentioned variations:

- Problems with determining agonal respiration.[7]
- Problems with determining the caller's location This is managed by another sub-project in which a 113 app and a technological solution for the transfer of the caller's GPS location to the 113 centres has been developed.[8]
- The 113 operators' varying experience with receiving and handling calls regarding cardiac arrest. The project has estimated that the average number of cardiac arrest incidents per 113 nurse annually varies between 2 and 18 incidents. Based on available knowledge regarding the relationship between experience and quality for this type of incidents, the project group considers that 113 operators should as a main rule have a minimum of 10 cardiac arrest incidents per year in order to perform well in terms of quick identification of cardiac arrest and quickly initiated T-CPR. When the 113 operator does not obtain the necessary experience through handling real-life incidents, this should be compensated for via simulation training.[9]

Results of measuring

The 113 centres have reviewed all telephone records for cardiac arrest and measured quality indicators since the autumn of 2017. Although there are small amounts of data, the measurements show that there is a difference between different 113 centres and between different incidents at the same 113 centre. The median time until identified cardiac arrest was 46 seconds at the start of the sub-project (measured 60 seconds), while the time until commencement of CPR was 165 seconds (measured 120 seconds). Therefore, there is a need to reduce the time delays that are caused by system factors. Time spent in the review of individual incidents in telephone recordings varies, but it is estimated to be 45 minutes per incident, somewhat more if combined with a debriefing of the 113 operator.

At the start of the sub-project, time until recognised cardiac arrest (median) varied from 20 to 100 seconds, while time until commencement of CPR varied from 40 to 284 seconds. Although this covered a smaller number of incidents, it clearly shows that there are significant differences between the centres.

Measures

In order to facilitate such simulation training, the Directorate of Health will in cooperation with SAFER offer facilitator courses for representatives for the country's 113 centres in June 2018.

Objectives for the public

- Increased knowledge regarding 113 and how 113 and the public interact.
- Reduce the time from the time-critical incident occurs until the public calls 113.
- The public will receive training in performing life-saving first aid (e.g. airway management and CPR) and guidance from 113.
- That the public contact 113 directly in the event that cardiac arrest, stroke, heart attack and serious injuries are suspected.

Objectives for 113

- Reduce the time from receiving a distress call to 113 until the 113 operator has identified cardiac arrest (75% are identified within one minute).[10]
- Reduce the time from the receipt of a distress call until the first compression to 2 minutes.[11]
- Increase the proportion of identified cardiac arrests before the ambulance arrives to more than 95%.
- Increase the proportion of cardiac arrests that receive instructions in the form of telephone CPR to 90%.
- Increase the quality of telephone CPR.

- Examine whether different populations (e.g. children, the elderly and minorities) use different terms to describe cardiac patients.
- Increased use of the Cardiac Arrest Registry and increased use of defibrillator prior to the ambulance arrival.
- The establishment of a national scheme for training and use of first responders.[6]
- Continue to develop matters in the Norwegian index for medical emergency assistance for more precise identification of patients with stroke.

Recommendations

The project has demonstrated the value of monitoring and analysis of the 113 centres' handling of cardiac arrest to improve the quality and thereby also survival. Efforts should also be initiated in relation to other time-critical conditions. The following are the group's recommendation:

Basic training for 113 operators

We recommend that all 113 operators (both nurses and resource coordinators) receive training in rapid identification of time-critical conditions (here defined as cardiac arrest, stroke, heart attack and serious injuries), training in guidance of callers, and use of the AED Registry, when relevant. This should take place through simulation training and should also include training in handling situations where the assessment is difficult (borderline cases).

Training/maintenance training

We recommend that all 113 centres conduct regular maintenance training in identification of time-critical incidents and good instruction to the public, preferably through simulation training. Such maintenance training should be offered to all 113 operators a minimum of once annually. The training should include NAKOS' T-CPR course, scholarly material on time-critical conditions and defibrillator training. For cardiac arrest, it is recommended that the sum of the number of conducted telephone CPR and simulation trainings should be a minimum of 10 per year per operator. Local facilitators should conduct the main part of the training.

Review of telephone recordings

The project group recommends that routines are developed at all EMCC centres for the review of telephone recordings of time-critical incidents. The implementation should be prioritised as follows:

1. cardiac arrest
2. stroke
3. serious injuries
4. heart attack

For cardiac arrest and serious injuries, instruction and first aid performed by the caller is important to the patient, while for strokes and heart attacks, the time for reporting is most important. For cardiac arrest, we recommend that all telephone recordings should be reviewed, and for the other conditions, we recommend that the times are measured but that reviews of the entire telephone recordings are conducted regularly of a selection of incidents. All time-critical incidents that were coded as yellow priority should be included here.
The review should be led by qualified personnel, and combined with a debriefing of the 113 operators' handling of the incident. Focus should be on learning and quality improvement, both for the individual operator and for the 113 centre. Furthermore, measurements should be made of

critical time periods based on telephone recordings. Proposal for measurement points are provided in annex 2. The management at the various centres are responsible for the implementation of the recommendations and that the tasks and handled in accordance with the recommendations.

Feedback to 113 operators.

The 113 centres should develop procedures for feedback to 113 operators regarding their handling of time-critical incidents. This applies both to the handling of incidents in 113, and feedback on patient outcomes, but limited to the applicable chain of events. The Health Personnel Act Section 29c regulates such feedback.[3] Procedures must be created for how this should be organised in accordance with legislation. The purpose is to enhance the motivation of the 113 operators, and to stimulate increased learning.

Facilitator courses for representatives for the 113 centres

The group proposes that three-day facilitator courses are arranged to train personnel at all the country's 113 centres. Safer has committed to arranging the course. The first course will be conducted in June 2018. The course seats for this first course will be paid for by the Directorate of Health, while travel and accommodation will be covered by the employers. The course will be arranged twice annually to compensate for withdrawal/turnover of personnel. The course will focus on building knowledge regarding time-critical conditions, the significance of 113 for instructions in first aid, guidance and rapid treatment, developing skills in simulation, facilitation and debriefing as a working method, and knowledge regarding effective communication with the caller. It is recommended that two people participate from each 113 centre, to ease the facilitation of a learning environment locally. These individuals will then work to conduct simulation training, review of telephone recordings and debriefing in their own 113 centres. The management is responsible for facilitating local implementation, within safe frameworks.

Reporting

It is recommended that the 113 centres register quality indicators and report relevant data to quality registries. The following parameters are proposed (see annex 2)

Cardiac arrest from March 2018	-Identified cardiac arrest at some point during the conversation -delayed identification due to use of parts of the Norwegian index for medical emergency assistance other than cardiac arrest instruction cards. -was telephone CPR offered -was CPR performed -was the algorithm in the Norwegian index for medical emergency assistance followed -time until identified cardiac arrest

-time until the first compression

Stroke -time from the onset of symptoms until first contact with 113
from September 2018 -time from first contact with 113 until red priority/ambulance notified
-potential deviations from the Norwegian index
-whether reporting to 113 comes from patient/next of kin or other parts of the health services
-delivery location

Heart attack -time from the onset of symptoms until first contact with 113
from December 2018 -time from first contact with 113 until red priority/ambulance notified
-potential deviations from the Norwegian index

Serious injuries -time from first contact with 113 until the first unit arrives at the place where the incident occurred
from March 2019 -whether advice was provided to the caller regarding first aid (airway management, stopping haemorrhaging, heat, secure place where incident occurred)
-whether the Norwegian index was correctly used (if relevant)

"Marketing" of 113

Little systematic information work has been carried out regarding 113's function in relation to the public. The group is of the opinion that a common information strategy should be facilitated, in which 113 locally and nationally informs about the emergency medical telephone number 113, regarding criteria for contacting 113 and that the public receives guidance in first aid from competent health personnel by contacting 113. The message should build on the idea that "you are never alone".
Furthermore, interaction between the public and 113 should be disseminated and practised in all Norwegian first aid courses. No one knows the public better than 113 in emergency medical situations. It is therefore recommended that representatives from 113 are invited to become members of the Norwegian First Aid Council and the Norwegian Resuscitation Council.
Efforts should be made in order to harmonise national algorithms for life saving and first aid in terms of the advice the public will receive when a 113 operator uses the Norwegian index. Since practice at 113 is to guide everyone, including health personnel, courses for health personnel should also include knowledge and training on interaction with 113. This will contribute to efficient, important and targeted marketing of 113.
For example, the London Ambulance Service has a Twitter account which is frequently used in information work.[12]

Special groups

Health personnel

Health personnel who contact 113 should regularly be offered guidance/instructions just as other callers. Experience shows that they often are in need of guidance for life-saving first aid but that such guidance is often not provided. The reasons may be that 113 operators presume that health personnel are qualified and capable of providing first aid, which is not always the case.

Others

The sub-project 113 will cooperate with other sub-projects to improve guidance for special groups of callers, e.g. children, the elderly and minorities.

Research, development and international cooperation

Develop training of 113 operators

- Rakos will continue to work to develop a 113 simulator where you can practice communication between callers and 113, and between 113 and health resources.
- Simulation training at all 113 centres should be facilitated.
- Safer will arrange courses in facilitation/debriefing to qualify facilitators at the 113 centres.

Develop training of Norwegian CPR instructors and the public for optimal interaction

- 113 should contribute to training of Norwegian First Aid instructors and CPR instructors regarding interaction between the public and 113.

Further develop the Norwegian index for medical emergency assistance

- Contribute to validate the advice provided in the index, through e.g. sharing of experience and participation in research.

Other recommendations

- We recommend the establishment of a network/advocacy group for 113 personnel, that can facilitate professional development and transfer of experience, domestically and internationally. Initially, this network should focus on the implementation of the recommendations from Saving lives together. The network should meet a minimum of twice annually, e.g. in connection with one of the national emergency medicine conferences.

- Develop technology that improves interaction between callers and 113 (such as a 113 app, T-CPR Link). The Directorate of Health will continue to work on this is a separate sub-project.
- Develop technology that makes it more efficient for the public to obtain a defibrillator, e.g. through the Defibrillator Registry www.113.no and via apps.
- Research regarding interaction between callers and 113 should be facilitated. This is a topic that is relevant internationally, in research communities in the USA, Europe and Asia. A research strategy should be developed which highlights the need and value of effective interaction, ethical perspectives, challenges and solutions, and what significance the interaction has in terms of increased lifespan and quality of life.
- The sub-project 113 has commenced with improvements in the handling of cardiac arrest, but will also make improvements to 113 for other time-critical conditions. This will, among other things, include reviews of selected telephone recordings, especially those that have been coded as yellow priority at the 113 centres, feedback on patient outcomes to increase the learning effect of previous incidents, debriefing of real-life incidents and simulation training of 113 operators.

Annex 1: Status for time-critical incidents

Cardiac arrest

Every year, approximately 3000 suddenly unexpected cardiac arrests are registered outside Norwegian hospitals. The actual figure is probably higher.[13] The incidents that are registered in the Cardiac Arrest Registry are the cases in which resuscitation is attempted by lay persons and/or health personnel, but only approximately 14% of these survive.[13] *The chain that saves lives* describes four stages that must all be optimised in order to save lives in the event of cardiac arrest: that those present understand the severity and contact 113, early commencement of CPR, early defibrillation, and post-resuscitation treatment in hospital.[14] Important factors that affect survival are time until commencement of CPR,[15] time until defibrillation (with shockable rhythm),[16] and time until advanced CPR by ambulance personnel or other first responders.[17] In the Saving lives together project, one of the main objectives is to save 200 more lives, an objective which will bring survival rates in Norway on par with Denmark.

Stroke

Every year, approximately 12,000 patients have a stroke,[18] 8,500 are registered in the Norwegian Stroke Registry (which has a coverage of 84 %).[19] 85 % of these are caused by thrombosis (blood clots), 13 % haemorrhages.
Approximately 2000 people die annually as a result of stroke.[20] If we include all cardio-vascular disease, the figure is approx. 2500 (Christian Lycke Ellingsen, conveyed personally).
There are no certain calculations of what stroke costs, but a study from 2007 estimates that the annual lifetime costs is NOK 600,000 per patient, and that the total societal costs is NOK 7-8 billion annually.[21]
Thrombotic stroke can be treated with thrombolysis. This must be administered within 4,5 hours from the onset of symptoms. The effect is greater if it is administered within 3 hours, and even greater if it is administered within 60 minutes of the onset of symptoms. The treatment contains many potential delays, both from patients/next of kin, in emergency medical services and at the hospital. A study has shown that the proportion of patients who receive thrombolysis within 60 minutes can be increased from 2 to 18% without increasing mortality.[22] The proportion of stroke patients (quality parameters) who receive thrombolysis is 18 % but varies from 5 to 32% between various hospitals.[19] Only 42 % of all stroke patients are admitted to hospital within 4 hours of the onset of symptoms, which is the window for thrombolysis treatment.[19] One of the objectives in the Ministry of Health and Care Services's letter of commission to the regional health authorities for 2018 is that this proportion shall be increased to a minimum of 20 % and that a minimum of 50 % of these receive this treatment within 40 minutes after admission.[6] In 2016, this proportion was 64 % but varied between 20 % and 86 %.[19]
In a study from 2009-10 at Akershus University Hospital (299 patients), all patients who were admitted with acute stroke were studied over the course of one year. In these incidents,

patients/next of kin contacted 113 directly in 64 % of the cases, and 94 % of these were transported directly to hospital by ambulance. From those who contacted their regular general practitioner or intermunicipal emergency primary medical care centre, 61 % were asked to travel to the doctor's office or intermunicipal emergency primary care centre.[23] These patients had longer patient delays than those who contacted 113 directly.
Another study shows that only 48 % directly contact 113 in the event of stroke, and that 113 only identifies 58 % of stroke cases.[24]
Communications regarding patients with suspected acute stroke should go directly to 113.[25]
Time delays can be reduced if the population is trained in symptoms of stroke and how they should react.[25] Only 60 % of the population know how to "provide first aid" to a person with symptoms of stroke, and there is a need to increase the population's awareness of early contact with 113.[26]

Serious injuries

Injuries and poisoning are responsible for approximately 2500 deaths annually in Norway.[27] With an incidence of 40/100,000, this constitutes 6 % of all deaths in Norway.[28] It is the most common cause of death among young people under the age of 44 and therefore represents a major loss of lifespan.[20] For serious injuries, it is estimated that 1.8-4.5 % of those who die could have been saved if bystanders provide airway management and stop major haemorrhaging.[29] 2 % of 2500 will constitute an estimated 50 lives per year.
There is an unknown effect on other objectives on outcomes like recovery time, sequelae and hospitalisation. However, just under 300,000 people are treated by specialist services for injuries, and 95 % of these cases are caused by accidents, the rest mainly violence.[28] Most trauma patients who require first aid, receive it from bystanders, but there is room for improvement (according to a study from Troms and Finnmark).[30] 76 % of the 43 patients who needed airway management received this first aid measure from bystanders. 81 % of the 63 patients who needed to immediately stop haemorrhaging, received this assistance, and 62 % of 204 received prevention of hypothermia. [30]

Heart attack

Acute heart attack affects 12-13,000 people annually in Norway.[31] Effective treatment of Heart attack requires early diagnosis and treatment. Treatment of acute heart attack entails targeted efforts for early revascularisation through thrombolysis and/or acute PCI. The objective of the treatment is to ensure revascularisation within 90 minutes of the onset of symptoms. Untreated or delayed treatment of heart attacks entail a danger of cardiac arrest, serious and chronic heart failure. Median time from the onset of symptoms until the first medical contact (defined as time for pre-hospital examination or at emergency ward) for ST-Elevation Myocardial Infarction (STEMI) in patients under 80 years of age is 60 minutes.[31] The following is referenced regarding time until revascularisation for STEMI: "*On a national basis, 40 % of the*

patients were revascularised within the recommended time. If you extend the deadline for primary PCI from 90 minutes to 120 minutes after there first medical contact, it was still only 57 % of the patients who were revascularised within the recommended time."[31] A good target achievement is set at 50 %, for very good target achievement 80 %. The variation between the health authorities is greater in terms of system-dependent delays (i.e. from the first medical contact until the start of reperfusion therapy) than in terms of patient-dependent delays (i.e. time from the patient experienced symptoms until the first medical contact).
For non-ST-elevation myocardial infarction (NSTEMI), 76 % of patients on a national basis are invasively assessed. Good target achievement is defined as >70 %, very good as >85 %. 62 % of patients with NSTEMI were assessed by angiography within 72 hours, good target achievement is >50 %, very good >80 %.

113

When you call the emergency medical telephone number 113, you reach the the Emergency Medical Communication Centre (EMCC, here referred to as 113). The 113 personnel consists of nurses and resource coordinators who normally have a background as ambulance personnel or paramedics, and who have completed supplementary training for work as operators. 113's main task is to handle communications regarding emergency medical conditions. They are to provide necessary advice and guidance, prioritise, register, initiate, coordinate and follow-up emergency medical assignments.[4]

Survival can be described as a product of medical science, effective training and local implementation.[32] The following performance factors are considered to result in increased survival in the event of cardiac arrest:[33]

Identify and treat more who have cardiac arrest, towards Denmark's level	60 lives
Shorten time to first compression by 30s, i.e first compression within 2 min	20 lives
Improve the quality and thereby the effectiveness of CPR from a factor of 1.5 to 2.0	100 lives
Double the use of defibrillator prior to ambulance arrival	20 lives
In total	200 lives

It is likely that we can save more lives by optimising the training and practice of lay persons and 113 to work together as a team. The public rarely provide life-saving first aid alone. In Oslo, 12-13 % of CPR is initiated prior to making contact with 113,[34] despite the fact that 89 % of the population is trained in first aid.[26]

To varying degrees, the 113 centres have systematic approaches to basic training and maintenance training of 113 operators, and operators rarely receive feedback on how they handle time-critical incidents.

There are also other measures that can be used to increase survival, including volunteer first responders,[35] professional first responders including the fire service,[36] use of deployed defibrillators,[37] newer and more modern technology for precise localisation of callers, smartphone apps and digitalisation of all 113 systems. These measures will be considered in other sub-projects.

Roles and responsibilities for cardiac arrest

Interaction between callers and 113 entails a sharing of roles and responsibilities. 113 personnel are professionals and emergency medically competent. Callers are lay persons or health personnel, and often in a situation as next of kin. Only exceptionally, are the caller and patient completely foreign to each other.[38] 113 personnel's responsibility towards the patient is to provide necessary advice regarding first aid.[4] The caller's responsibility towards the patient is to answer questions and follow the advice that is given. The interaction will then attempt to identify cardiac arrest, initiate and ensure the quality of CPR and use the Cardiac Arrest Registry to obtain a defibrillator if this is possible. Sometimes, 113 needs to calm the caller,[39] and guide the caller in the use of a defibrillator.

Identifying cardiac arrest can be difficult, especially with agonal respiration[40] and spasms.[41] Few callers are aware that the patient has a cardiac arrest before they call 113. Therefore, the decision to start CPR is usually done together with 113.[42] It is therefore crucial that 113 identifies that the patient is having a cardiac arrest early, as this enables guidance in CPR and dispatching of sufficient resources, which results in increased survival.[43] But this is difficult also for 113 operators, and the sensitivity required to identify cardiac arrest has been measured to between 78 to 94 % at various 113 centres.[7] This may in part be due to the fact that there is no common understanding of what is defined as "abnormal respiration".[7] More knowledge is therefore needed to increase the sensitivity and specificity for cardiac arrest in 113.[44]

For cardiac arrest, it is important that 113 is contacted early. There is little data on how long it takes before 113 is contacted, but some will call others first (family, intermunicipal emergency primary care centre, regular general practitioner, other health personnel, police, fire service). Figures from Sweden show that the median time from cardiac arrest until contact with 113 is 2 minutes.[45] It is important that 113's competency, role and responsibility is disseminated to the population, and that it has one name ("113"). Compared with the other Nordic countries, Norway has a logistical advantage of approximately 20 seconds, as the other Nordic countries must go via a shared reception at 112, and then be transferred to health [46]

When callers contact 113, the caller/person present and the 113 operator will form a team.[47] The 113 operator is the professional party in this team,[48] that provides guidance/instructions to the caller and takes the role as team leader.[49] All callers are entitled to receive instructions in CPR from the 113 operator (telephone CPR), as this both increases the number of members of the public who perform CPR, the quality of CPR and survival for cardiac arrest.[50-52] In order to achieve this, continuous training and quality improvement in identifying cardiac arrest and the implementation of telephone CPR is necessary.[10] With targeted training, simulations and structured feedback, the identification of cardiac arrest in 113 can be increased to 95 %.[34] Rapid identification and shortened activation time in 113 can increase survival.[53] The large number of employees in 113 means that the number of incidents involving cardiac arrest per employee is low (see fact box).

A survey among the country's 113 centres in 2017 shows that the average cardiac arrest incidents per 113 nurse per year varies between 2 and 18 (own data). Furthermore, some cardiac arrest incidents are handled by other 113 operators.

By using a standardised protocol, 113 will be able to more easily identify cardiac arrest,[54] resulting in more rapid identification and dispatching of ambulance.[55,56] The 113 centres use the *Norwegian index for emergency medical assistance*, which was first introduced early in the 1990s. Nevertheless, there is a great amount of variation in how the protocol is used, both between individuals and between 113 centres.[57] Rapid identification of cardiac arrest and commencement of telephone-guided CPR can be achieved by the no-no-go rule (unconscious, abnormal breathing, commence CPR).[56]

All calls to 113 are recorded in telephone recordings. Regular reviews of telephone recordings will contribute to quality improvement through an increased degree of identification of cardiac arrests and increased quality of telephone-CPR.[2,48]

Furthermore, it is important to report results from cardiac arrest treatment, locally, nationally and internationally, and to mark good results as motivation to further improve the system.[10]

Annex 2: Proposals for measuring points for reviews of telephone recordings in 113

Measurements of quality parameters for cardiac arrest

Instruction criteria

All assignments where ambulance/health personnel establish cardiac arrest upon arrival at the patient.
All times (that are reported to the Cardiac Arrest Registry) are measured in date and hours:min:sec. The time interval (for local quality assurance) is measured from the time the 113 operator answers the phone, based on the telephone recording, not AMIS.

Objective no. 1: *Identified cardiac arrest at some point during the call?*

- *Yes/No*
  - The 113 operator has identified cardiac arrest if at some point during the call the operator instructs the caller to commence CPR/compressions/ventilations or that CPR instructions are commenced without specifically stating that this must be done.

Objective no. 2: *Delayed identification due to use of parts of the Norwegian index for medical emergency assistance other than cardiac arrest instruction cards.*

- *Yes/No*
  - E.g. that the patient has agonal respiration, and the operator turns to the entry for unconscious, breathing normally, and places the patient in the lateral position, instead of commencing CPR.
  - If cardiac arrest is identified and the instruction cards for cardiac arrest are followed throughout the call, this is coded as “no”.
  - If cardiac arrest is not identified, this is coded as “no”.
  - If a delay occurs in the identification of cardiac arrest due to circumstances at the location, this is coded as “no”.

Objective no. 3: *Was telephone CPR offered?*

- *Yes/No*
  - If no: reason?
    - Cardiac arrest not identified
    - The person present performed CPR without instructions
    - The caller is not on-site
    - Communication problems
    - No need for CPR (appears to be dead)
    - Other

Objective no. 4: *Was CPR performed?*

- *Yes/No*
  - If no: reason?
    - The caller is not on-site
    - The caller is unwilling/unable to commence CPR
    - Communication problems
    - The patient is showing signs of life
    - Other

Objective no. 5: *Was the algorithm in the Norwegian index for medical emergency assistance followed?*

- *Yes/No*
  - Is continuous guidance and encouragement continued throughout the entire call?
  - If continuous guidance is provided during parts of the call, this is coded as "no".

Objective no. 6: *Time until identified cardiac arrest*

- Time registered when the 113 operator says "Now you must commence resuscitation. I will help you", or that the caller is told to commence CPR / compressions / ventilations

Objective no. 7: Time of the first compression

- The timing when the caller/someone is heard giving the first chest compression.
- Preferably the time when the caller counts out loud together with the operator.
- If the caller does not count out loud, the marked time is when the caller either says that he/she is performing compressions/ventilations, or when it is audible on the telephone recording that compressions are being performed.
- If there are doubts are to whether CPR is audible, this time must not be registered.
- Not measured if the instruction commences with ventilation instead of chest compressions, or when cardiac arrest occurs after the arrival of ambulance or health personnel.

Measurements of quality parameters for cardiac arrest

All times are measured in date and hours:min:sec.

-time from the onset of symptoms until first contact with 113

-time from first contact with 113 until red priority/ambulance notified

-potential deviations from the Norwegian index

-whether reporting to 113 comes from patient/next of kin or other parts of the health services
-Delivery location (hospital, intermunicipal emergency primary

care centre, regular general practitioner)

Measurements of quality parameters for cardiac arrest

-time from the onset of symptoms until first contact with 113
-time from first contact with 113 until red priority/ambulance notified
-potential deviations from the Norwegian index

Measurements of quality parameters for serious injuries

-time from first contact with 113 until the first unit arrives at the place where the incident occurred
-whether advice was provided to the caller regarding first aid (airway management, stopping haemorrhaging, heat, securing place where incident occurred)
-whether the Norwegian index was correctly used (if relevant)

Annex 3: Participants in sub-project 113

Iris Veiseth-Nilsen, EMCC Finnmark
Inger-Lise Kristiansen, EMCC Tromsø
Janne Martinsen, EMCC Bodø
Jan Erik Stokka, EMCC Helgeland
Bodil Margrethe Holm, EMCC Nord-Trøndelag
Hilde Susanne Holst, EMCC Sør-Trøndelag
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Ole Kristian Skomedal, EMCC Sørlandet
Randi Holmar Ellefsen, EMCC Vestfold-Telemark
Hilde Rikheim, EMCC Vestre Viken
Marie Arnesen-Sylten, EMCC Oslo
Sissel Grønlien, EMCC Innlandet
Camilla Hardeland, NAKOS
Helge Myklebust, Laerdal Medical
Bjørn Jamtli, Directorate of Health
Conrad Bjørshol, Project Manager Stavanger University Hospital

At the first meeting, Linda Soillami participated for EMCC Oslo, Kjetil André Våge for EMCC Haugesund, Søren Stagelund for EMCC Tromsø and Stein Helge Stormo for EMCC Finnmark.

Annex 4: Example of form for review of telephone recording of 113 call

Form that has been used by EMCC Oslo to telephone recordings for cardiac arrest. Reproduced with permission.

- **Avklarer, lokaliserer og bekrefter adresse**
  - Ikke mulig å avklare adresse innen rimelig tid
  - Avklarer før 60 sekunder
  - Avklarer før 90 sekunder
  - Avklarer etter 90 sekunder
  - Avklarer ikke

- **Tidspunkt der operatøren sier: Nå må du starte HLR/veiledning/kompresjoner**
  - 60 sekunder
  - 90 sekunder
  - 120 sekunder
  - Etter 3 minutter
  - Ikke gjenkjent

- **Tidspunkt der man hører innringer/noen på stedet komprimerer eller teller høyt**
  - Innen 2 minutter
  - Innen 3 minutter
  - Innen 4 minutter
  - Etter 4 minutter
  - Ikke startet veiledning av forklarlige årsaker
  - Ikke startet veiledning

- **Hvilken type veiledning ble gitt**
  - Kontinuerlig og korrekt veiledning ble gitt gjennom hele samtalen
  - Deler av veiledningen ble gitt
  - Ingen veiledning ble gitt

- **Formidler at ambulansen er på vei**
  - Nei
  - Ja

- **Bruker HLR-knapp**
  - Nei
  - Ja

- **Operatør varsler ambulanse på kode 1**
  - Innen 90 sekunder
  - Etter 90 sekunder

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