5G4Healthcare

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Introduction

Healthcare in rural areas is facing special challenges that make home care for elderly people and integrated, cross-sectoral care of multimorbid and chronically ill patients very resource-intensive. Coordination between healthcare professionals, issues of mobility, information exchange and logistics are critical elements and make provision of care extremely complex. Innovative and digital solutions along the entire healthcare value chain will therefore become essential for effective and efficient delivery of care, particularly in rural settings.

Methods

Against this background, the project 5G4Healthcare aims to assess feasibility, possibilities and limits of improving the effectiveness and efficiency in rural healthcare using 5G technology as facilitator. Moreover, recommendations for action and for scalable solutions will be derived. The project studies 5G in the use cases “integrated care” and “homecare”. Therefore, detailed scenarios, workflows and patient journeys of these use cases are modelled and designed (phase 1), technically implemented in exemplary 5G-settings (phase 2) as well as tested and evaluated (phase 3Livings labs are being built at facilities of regional health care providers. There application-oriented benefits and opportunities of 5G technology for application of digital solutions will be assessed, e.g. in the areas of remote diagnosis, medication, emergency care or robot-assisted surgery.

Results

Sustainable project results are aimed at the development of a capability maturity model for digital healthcare services, a standardized technology assessment approach and a virtual healthcare centre. This in addition to conventional healthcare facilities, should enable permanently available, high-quality healthcare delivery regardless of physically available resources.

Conclusion

Overall, the project creates an open 5G-based research and development platform that can be used as a test bed for a comprehensive digital health-based care approach in rural areas.

Towards an integrated emergency medical care using 5G networks

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Introduction

The Interoperability of medical devices and IT systems using various technologies in clinics and the preclinical area is still a research topic. The MOMENTUM project deals with the new 5G mobile technology and explores how they contribute to an improvement in emergency care.

Methods

In a first step, fields of application were identified together with clinical and technical experts. These are based on the treatment chain in emergency care and include medical information, monitoring and reporting, emergency medical diagnostics and the emergency medical therapy in the clinic.

Results

The identified use cases lead to special requirements for the components involved and the software/hardware architecture. The focus is on the security of patient data and the performance requirements for future applications for instance ai based support applications or applications for augmented reality. Taking into account the current literature and systems already on the market, architecture concepts for integrated emergency care were developed. Attention was paid to the use of established and emerging standards and IT security.

Conclusion

The Momentum project is dedicated to data acquisition, forwarding, and processing in emergency treatment. It evaluates the extent to which 5G communication inside the ambulance vehicle and emergency room, as well as between these functional units, can contribute to better data processing/integration and safer treatment of the patient.
Integrated emergency care seems sensible, particularly for emergencies outside of metropolitan areas and for particularly critical cases.

Requirements for 5G Integrated Data Transfer in German Pre-hospital Emergency Care

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Introduction

The MOMENTUM research project, funded by the Federal Ministry of Education and Research, aims to develop a standardized interconnection of medical devices used in preclinical emergency services as well as a completely integrated communication approach between all medical entities involved in preclinical emergency care. In pursuing this project, we are trying to overcome the limitations of previously developed systems that have been implemented to date, each of which only represents parts of the communication from ambulance via emergency command center into the hospital and vice versa. In this paper, we illustrate the results of the requirement analysis.

Methods

After observations and investigations in both German emergency medical services and trauma centers, we collected medical and technical requirements that need to be addressed when developing an integrated communication infrastructure between emergency medical services and trauma centers.

Results

We analyzed the conditions of German emergency medical services and deducted medical and technical requirements. The medical requirements comprise of continuous transmission of vital sign/monitoring data or digital medical documentation. Technical requirements range from connectedness of medical devices inside an ambulance to integration of an electronic emergency record into an overarching communication infrastructure connecting the ambulance vehicle, the emergency command center and potential target clinics. Bidirectional data transmission is supposed to be achieved using the modern 5G mobile communication standard.

Discussion & Conclusion

We present the requirements for an integrated communication system and device connectivity in preclinical emergency care. The results are part of the working plan of the MOMENTUM project. Given the necessary security measures, the 5G standard may allow preclinical entities to use mobile communication channels to transfer their data to all stakeholders. The MOMENTUM consortium will continue to conceptualize and implement technologies that will present integrated communication systems for preclinical emergency care.

Telemedical consultation for remote islands

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Introduction

HALLIGeMED is a research project that makes telemedical services available for remote islands. Especially for emergency medicine, telemedical physicians support nursing staff on the so called Halligen in medical cases of different types of urgency. The main objective is to improve the level of medical care and to ensure a high quality of life for all inhabitants. The project is funded by two federal ministries.

Methods

The University Hospital Schleswig-Holstein established a telemedical center, which is in 24/7 availability for all emergency calls from the Hallig. Here a physician receives all medical patient data from the hallig nurse that is transferred by mobile communication. The nurses are equipped with monitoring-, audio- and video devices to send live data.

Results

In the mid-term evaluation of the research project, data from the system logs was analyzed . Medical data like medical severity and number of delegated drug administrations made a quantitative evaluation possible. The time from the beginning of a telemedical consultation until drugs can be administered 20:14 min, which is significantly lower than the time for a helicopter to arrive (37:21 min). Additionally, surveys with the users (n=13) were conducted, showing a benefit of the concept in finding a diagnosis and when administering drugs.

Conclusion

Ongoing objective of the research project is to lay a cornerstone of positive results and arguments for a continuation of the telemedical system for the Halligen. The survey of the users showed a high advantage and further interest for the innovative concept. The main challenge to convince any funders is to generate highly valid data, which can only be reached with significant numbers of cases.

Requirement Analysis for an Aerial Relay in Emergency Response Missions

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Introduction

First aid of patients at the scene of an emergency requires an adequate flow of information. The publicly funded research project MOMENTUM (grant no. 16KIS1027) aims at seamlessly connecting the point of care to the hospital. An unmanned aerial vehicle serving as a network relay may help in cases of limited or no mobile wireless connection, e.g. due to topographical circumstances. The aerial system may also provide situational awareness in cases of mass casualty incidents. For these two defined use-cases, safety and stability considerations are discussed, and required flight times and payloads are defined.

Use-Cases

The elevated and optimized receiving position may aid the transmission of high volume data such as ultrasound images and other video streams. An onboard small-cell could additionally support the device-to-device connection of the medical equipment on-scene with a dedicated secure cellular network. The perspective from above also results in an advanced viewing angle, avoiding vision blocking by cars, trees, and rocks. Consequently, it helps to find patients in a shorter time and to figure out who is in need.

Requirements

The described use-cases pose design challenges as well as technical requirements. A minimum flight time of 17 minutes is decided based on on-scene time studies in emergency missions. A total of 5.35 kg results as a total payload to implement all described use-cases. The requirements shift between safety considerations and clear improvements at the point of care.

Conclusion

It is concluded that the use-cases can be realized best when using a multicopter - either combined with a cable for independent flight times and reliable data communication or a wireless solution to mitigate the risk from the increased payload while limiting flight time. For the first option, the payload of the aircraft should be adjusted to ensure the power consumption in hover matches the power limitation of the cable.