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Telemedical consultation for remote islands

Results from the mid-term evaluation of the HALLIGeMED project

Abstract: The following work gives an overview of telemedical consultation in emergencies based on a research project. A telemedical centre located at a university hospital offers medical expertise for rural islands independent from place, time and urgency. Medical employees on the islands were relieved in matters of responsibilities and received medical support whenever it is necessary. Results from the projects mid-term evaluation compare the innovative concept with the conventional approach.

Keywords: telemedicine, emergency medicine, eHealth, Quality of life

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1 Introduction

The so called “Halligen” are small islands in the North Sea close to the coast. The acute medical care there with the geographical peculiarities poses an enormous challenge. The spectrum of diseases ranges from abdominal pain in a child to a heart attack in a visitor or resident of the islands. In all medical issues ranging from prophylaxis to emergency treatment there is only one nurse responsible. Ambulance services or located physicians don’t exist on these islands.

Through the establishment of a telemedical consultation system within the framework of the “HALLIGeMED” project, which is funded by the Ministry of Social Affairs, Health, Youth, Family and Senior Citizens and the Ministry of the Interior, Rural Areas and Integration, the specialist personnel deployed on site can be decisively supported and instructed in initial assessment and care by specialists from the University Medical Centre Schleswig-Holstein (UKSH).

In addition to better networking of the partners involved in emergency care, this contributes to a significant increase in patient safety.

It is necessary to bridge the physical distance between the remote Hallig and the telemedicine centre in Kiel and to transfer the patient’s medical data. The primary goal is to improve the medical care of the inhabitants and the visitors at any types or urgencies. Furthermore, telemedicine enables a medical treatment for all patients at an early stage, which otherwise can only be initiated by helicopter when the emergency physician arrives. Even while the emergency physician is still on his way by ship or in the air, the telemedicine specialist can support the Hallig’s nurse via video and audio transmission by delegating the administration of medication or instructing him in medical measures. In addition, the medical expertise helps to assess the medical severity and urgency of treatment and thus reduces the number of expensive helicopter missions. The research project has to face the unique circumstances of the Halligen and their special concept of care. The main challenges are to deal with the heterogeneous mobile network coverage, which is necessary for an optimal data communication and to reach a high user compliance on the site of the Halligen. HALLIGeMEDs experience in telemedicine will find further application in a new project approach.

The MOMENTUM research project, funded by the Federal Ministry of Education and Research, aims to develop a standardised interconnection of medical devices used in preclinical emergency services as well as a completely integrated communication approach between all medical entities involved in emergency care. In pursuing this project, we are trying to supersede the limited capabilities of current telemedical systems for emergency medical services.

In this paper, we highlight the most important findings from the mid-term evaluation of the HALLIGeMED project.

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2 Material and Methods

The setup of the telemedicine centre within HALLIGeMED is similar to other institutions using the “Telenotarzt” system. Several screens show incoming general

and medical live patient data, a documentation screen of the telemedical emergency physician, a list of standard operating procedures, which include all the emergency diagnosis keywords and give a hand in relation to the approved treatment and finally a map with the current location of the place of action.

Especially the medical documentation software is the basis for an essential part for the project evaluation. It is possible to generate statistics containing results of general field data, e.g. frequency of consultation and the number of claims of the telemedical system per Hallig. Additionally, even medial evaluation becomes realizable due to software documentation, e.g. time intervals until medication is dispensed. These measurements are possible due to automatic timestamps whenever medication is dispensed.

To extend the quantitative mid-term evaluation with qualitative aspects two surveys were conducted. The main objective was to identify individual perspectives of the users, mentioning the telemedical physicians as well as the Hallig nurses at the far side of the application. Due to the fact the project team at the institute works in directly face to face contact only with the physicians, it's even more challenging to get into the perspective of the Hallig part, finding out their stance over the telemedicine concept. The intention was to identify possible negative attitudes against the system at an early point before the operators cease using it. The surveys were designed with mostly closed questions with a possibility of adding an additional free text note after each item. The range of approval regarding a statement was from 1 (low) to 7 (high).

The results include propositions of thirteen participants from the Hallig nurses and seven returns from telemedicine physicians.

3 Results

The telemedicine centre is in ongoing operation since March 2019. It started in an only-day coverage for requests from the Halligen. The 24/7 coverage was initiated in July 2019. The following results include results until the end of 2019.

In total, 43 emergencies were treated under telemedical consultation and expertise. In all cases the Hallig's nurses are free to call the telemedical physician whenever it's necessary in their opinion. There are no medical keywords or suspected diagnoses that force the nurses to use the innovative concept.

In average, each conversation took 19:43 minutes, measured from answering the call until hang up. This duration can't be seen as a full medical treatment because the telemedicine physicians don't go along the whole case every

time. Often, they were asked only to support in finding a diagnosis or rate an ECG.

The average time interval of the whole consultation differs from the conversation interval. It includes additionally the documentation tasks, which is required by law. The average consultation interval constituted 29:54 minutes.

The advantages of telemedical systems vary depending on the use cases and the operators. Thus, the concept of HALLIGeMED can't be compared to systems with digital physician to patient consultations nor to those which have a physical rescue service or early transport possibility. To get an individual overview and to proof the advantages in this project the Hallig nurses were asked to be part of a survey. Figure 1 shows the individual perception of the applied concept.

Figure 1: *Advantages in the HALLIGeMED concept (multiple selection was possible) own illustration*

It illustrates the high relevance of physician's support in finding the right diagnosis as well as the relief of responsibility when a medical application is indicated.

Especially the administration of drugs is an often-discussed aspect in the research project. Due to the long distance and time the helicopter takes to the place of emergency, the telemedical consultation can bring an essential advantage in drug decisions. As soon as the Hallig nurse arrives, the telemedicine is ready to start. There aren't any limitations in accessibilities of place or time. Figure 2 compares on the one hand the time interval from telemedical take off until the first drug is dispensed. On the other hand, the time interval from answering the call at the emergency coordination centre until the helicopter arrives at the Hallig is shown.

Time to drug application with telemedicine	20:14
Time until helicopter arrived	37:21

Figure 2: *Comparison between innovative and conventional process in relation to drug application, respectively arrival time (minutes), own illustration*

The meaning of this comparison is underlined due to the aspect the Hallig nurse must renounce of any team partners and need to act on her own. Secondly it must be considered as well that the helicopter crew needs additional time to get from the place of landing to the place of emergency, has to decide to administer any medication and to prepare their material.

A helicopter operation is necessary every time a patient needs an inpatient treatment. It's a task of the telemedical physician to ponder and decide whether this is indicated, or an outpatient care is possible. That decision has been in the Hallig nurse's responsibility in the conventional system before. Figure 3 shows the number of patients treated in- or outpatient whenever the case was attended telemedically.

Figure 3: *Follow up transfer and outpatient treatment*, own illustration

Besides the intention to improve the quality of life of the Hallig's inhabitants due to lower amounts of helicopter

operations it is a secondary objective to economise these operations in relation to their high costs.

4 Discussion & Conclusion

After a year of practising the innovative concept, the telemedical system became indispensable for the Hallig nurses and the inhabitants. Thus, it is a main objective to keep this model available in the local health care structure. To assure long-term financial support, further arguments are necessary. A focus purely on financial efficiency might be misleading as the cost benefit ratio will be biased considering a quite small target group. It's vital to acquire a bigger area of application. Thereby the validity of data would increase as well.

Author Statement

The author state besides the project funding of two federal ministries there is no funding involved. Authors state no conflict of interest. Informed consent has been obtained from all individuals included in this study. The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration.