

M-Health Telemedicine and Telepresence in Oral and Maxillofacial Surgery: An Innovative Prehospital Healthcare Concept in Structurally Weak Areas

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ABSTRACT

MHealth (Mobile Health) is an innovative prehospital healthcare concept in emergency medicine. This technology offers the transfer of medical knowledge using mobile devices such as smart phone applications or real-time communication methods. Surgically active dentists in structurally weak areas can be confronted in case of an emergency to situations, that require the guidance of a remote experienced oral and maxillofacial surgeon or an emergency doctor to treat potentially life-threatening conditions as early as possible. Thus, an interconnection of competence centres using real-time video communication is an appropriate technology. In the literature, various studies have been conducted to prove the huge potential of MHealth. The aim of this manuscript is to present a comprehensive MHealth concept for oral and maxillofacial surgery as well as for dentistry in the context of emergencies, something that is so far missing from the literature. The developed framework for using MHealth in oral and maxillofacial surgery opens up a new perspective of patient-centered care.

KEYWORDS

Dentistry, MHealth, Oral and Maxillofacial Surgery, Teledentistry, Telemedicine

INTRODUCTION

Several publications have appeared in recent years documenting emergency medical services (EMS) to be faced with continuously increasing numbers of emergency scenarios, resource shortages as well as increased arrival times, particularly in structurally weak rural areas (Büscher et al., 2014). In the last decade, new information and communication technologies (ICTs) have attracted much attention in emergency medicine from research teams. One approach to further improve medical emergency management is to complement the existing healthcare by using telemedicine, allowing diagnostics and treatments over geographical distances (Metelmann & Metelmann, 2016).

Quite recently, considerable attention has been paid to the emerging field of MHealth. MHealth is a field of biomedical engineering that offers the transfer of medical knowledge using mobile devices such as smartphone applications (voice and short messaging services, MHealth Apps) or real-time communication methods. Therefore, applications using the general packet radio service (GPRS), the third and fourth generation mobile telecommunication (3G and 4G systems) and video

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communication methods via internet play an important role (Moumtzoglou, 2016). The advantage of MHealth compared to traditional telemedicine lies in the fact that MHealth is independent of stationary devices. Previous studies indicate the MHealth technology to be an effective mobile telemedical approach (Metelmann & Metelmann, 2016).

As reported by Müller et al. (2008) medical emergency missions are not an exceptionally rare occurrence in general dental practice. Oral and maxillofacial surgeons, as well as dentists, can be confronted with emergency situations that require the guidance of an experienced oral and maxillofacial surgeon or an emergency physician in a remote location. Against this background, an innovative prehospital health care concept is an important issue to improve the quality of emergency care in dental practice. Recent MHealth concepts are limited to a connection between paramedics at the emergency site and a remotely experienced emergency physician. An application design for dentists, as well as oral and maxillofacial surgeons, does not exist in the literature.

This manuscript presents a comprehensive MHealth concept for dentistry as well as for oral and maxillofacial surgery and opens up a new field of patient-centered care in dental practice. After introducing the traditional prehospital emergency medicine concept, key oral and maxillofacial emergencies, as well as medical emergencies in dental practice are described. The following will summarize the required emergency equipment, and essential and additional emergency drugs to treat time-critical conditions at the emergency site. MHealth technology offers the transfer of medical knowledge to the emergency site using mobile devices, such as smartphone applications or real-time communication methods. Based on internationally gained experiences concerning MHealth in prehospital emergency medicine, the proposed MHealth concept design for a dental practice will be discussed. Finally, future research directions conclude the article.

BACKGROUND

Traditional Prehospital Emergency Medicine (PHEM)

PHEM involves specialized clinical abilities to treat a wide range of medical conditions, from minor illnesses and injuries to time-critical, life-threatening emergencies and acute pain (Galinski et al., 2010; Metelmann & Metelmann, 2016). That requires mastering a broad spectrum of multiple medical, surgical and trauma pathologies as well as non-clinical abilities including logistics, crew resource and rescue management, communication, teamwork, as well as the patient transport to a medical care facility if needed (Wilson et al., 2015). The results obtained by Roudsari et al. (2007) suggest four different medical emergency systems worldwide. They vary between countries in quality and range from (1) no organized PHEM structure in most developing countries, (2) basic life support, (3) advanced life support done by paramedics to (4) advanced life support by paramedics and emergency physicians. In most developed regions, medical professionals (paramedics, emergency physicians) make all efforts before arrival in the hospital as part of the advanced life support system (Metelmann & Metelmann, 2016).

Classification and Differentiation of Acute Emergency Cases in Dental Practice

The classification and differentiation between types of acute emergency cases in dental practice are primarily based on the departmental affiliation of the requested remote experienced physician. A classification is important in terms of professional workflow and emergency management, to advance patient safety and quality.

There are mainly two different types of acute emergency cases in a dental practice that are distinguished. One is urgent oral and maxillofacial emergencies (Table 1). They require the guidance of an experienced oral and maxillofacial surgeon in a remote location (e.g. in hospital) during prehospital management.

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