Acute Ebola virus disease patient treatment and health-related quality of life in health care professionals: A controlled study

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A B S T R A C T

Objective: This study aimed to identify predictors of health-related quality of life (HrQoL) and to investigate infection-related concerns in health professionals during the acute treatment episode for one Ebola virus disease (EVD) patient in tertiary care.
Methods: In a cross-sectional controlled study, validated self-report questionnaires were completed by three groups of health care professionals: (1) staff from standard internal medicine inpatient wards of a tertiary care center, (2) staff from the isolation unit of the same center responsible for Ebola patient treatment, and (3) staff from a research laboratory with contact to the Ebola virus and other highly infectious pathogens. Outcomes were HrQoL (SF-12), infection-related concerns, global health status, fatigue (FACIT), depression (PHQ-9), anxiety (GAD-7), and somatic symptoms (SSS-8).
Results: Comparisons between groups ($n1 = 42$, $n2 = 32$, $n3 = 12$) yielded no significant differences in HrQoL, subjective risk of infection, and most other psychosocial variables. However, the Ebola patient treatment group experienced significantly higher levels of social isolation than both other groups. The best predictors of poor physical and mental HrQoL were perceived lack of knowledge about the Ebola virus disease (physical: $B = -1.2$, $p = 0.05$; mental: $B = -1.3$, $p = 0.03$) and fatigue (physical: $B = -0.3$, $p = 0.02$; mental: $B = -0.53$, $p < 0.001$).
Conclusion: Ebola patient treatment in tertiary care does not seem to be associated with lower HrQoL and enhanced subjective risk of infection, but seems to yield feelings of social isolation in health-care professionals.

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Introduction

In 2014, the worst Ebola epidemic occurred in West Africa with an estimated case fatality rate of approximately 54% [1]. This epidemic not only affects the public, but also poses a high risk of infection of health care workers [2]. In the course of this epidemic, there has been no study thus far which has investigated the effects of Ebola patient treatment on the quality of life of health-care professionals in a Western tertiary care center. This is surprising given that increased physical and mental burden during acute treatment episodes can be expected in this population [3]. Therefore, we investigated the effects of Ebola patient treatment and different aspects of infection-related concerns on physical and mental components of health-related quality of life (HrQoL). The

importance of understanding the impact on HrQoL in the staff who treat Ebola virus disease (EVD) patients in academic tertiary care settings is becoming more pertinent as more countries with highly developed health care systems bring infected patients to be treated in their home country, for example, in the USA, Spain, and Germany. These countries offer biosafety level 4 units (BSL-4), comprising different means for minimizing the risk of infection such as personal protective clothing, special facilities for air conditioning, or complex disinfection routines. However, since health experts urge for more personnel to be involved in the fight against Ebola [4] the psychological impact on the lives of the hospital staff should be further evaluated.

Treatment of an Ebola virus disease patient entails a risk of infection, psychological stress, and emotional challenges [5]. Health care workers during the SARS outbreak in Toronto, Canada in 2003 suffered from high levels of psychological stress while treating patients [6,7]. High burdens of stress were also documented for the Kikwit Ebola outbreak in the Democratic Republic of Congo in 1995 [8]. Other research shows an association between negative life-events and occupational stress and higher levels of anxiety and psychological distress [9,10]. Moreover,

the work in a biosafety level 4 unit entails additional physical and psychological challenges, including the wearing of heavy protective clothing which leads to restricted communication with both staff coordinators and the patient as well as difficulties in performing diagnostic or therapeutic procedures. It cannot be assured that working with advanced medical equipment according to the highest technical standards will keep healthcare providers safe [11], for example, due to injuries caused by misuse or defects of medical equipment [12]. In addition, extended shift times can impair work performance and increase the risk of accidents [13]. Although staff work in modern hospitals and undergo intensive training before they can treat patients with highly infectious diseases, the psychological impact of an acute treatment episode for an Ebola virus disease patient on HrQoL is unclear. Staff with direct Ebola patient contact can be expected to show high levels of psychological distress, which may lead to impaired HrQoL. Furthermore, the staff members' social environment, explicit knowledge about transmission and stability of Ebola virus, infection-related concerns or individual fatigue might affect quality of life. For instance, social support and fatigue are important factors for coping with stressful patient-related situations [14]. Our study aimed to test whether hospital staff in direct contact with an EVD patient show reduced levels of health-related quality of life and higher infection-related concerns, when compared to (a) hospital staff with general patient contact or (b) laboratory staff who have contact with highly infectious pathogens, but no direct patient contact. Furthermore, we tested whether health-related quality of life can be predicted by variables related to infection concerns or fatigue.

Method

Design and sample

We conducted a cross-sectional controlled study at the University Medical Center Hamburg-Eppendorf, Germany and at the Institute of Virology at the Philipps University Marburg, Germany. HrQoL was compared in three groups of medical professionals: (1) staff from internal medicine inpatient wards of the University Medical Center, (2) staff responsible for Ebola patient treatment from the biosafety level 4 unit of the same medical center, and (3) staff from the biosafety level 4 research laboratory at the Philipps University Marburg.

Staffs were eligible to participate if they had direct patient contact or direct contact with the Ebola pathogen. Participants in group (1) were 78 staff who cared, in part, for severely and terminally ill patients but who had no contact to a patient with a highly infectious disease like Ebola. Participants in group (2) belonged to a team of 46 professionals who provided continuous monitoring of the infection and care for one Ebola virus disease patient. This patient received medical care and nursing for 18 days and was then released without infection. The Ebola case was highly publicized in the media as being the first case treated in a German hospital. Specifics of the Ebola virus disease patient's medical treatment are described in depth by Kreuels and colleagues [15]. We assume that our invitation to participate reached 16 eligible staff in group (3) who had no direct patient contact but who had contact to the Ebola virus and other highly infectious pathogens in their daily research work. Groups (1) and (2) were mainly composed of physicians and nurses, whereas group (3) was, with one exception, composed of laboratory staff. All eligible staff received an envelope with written instructions, the questionnaire and a return envelope. Completed questionnaires were collected in boxes on the wards.

Instruments

A self-report questionnaire was simultaneously disseminated to the three groups seven days after the Ebola virus disease patient was admitted to the hospital. The questionnaire comprised validated self-report scales that were focused on the last seven days, i.e. the duration of

patient treatment until that point. The standardized 12-item Short Form Health Survey (SF-12) was used to measure the primary outcome for this study: HrQoL. The SF-12 responses can then be used to calculate physical component summary and the mental component summary scores [16,17]. The SF-12 is widely used in clinical settings and has also been used to assess health status in occupational settings [18,19].

As secondary outcomes, concerns and worries related to the risk of an Ebola infection were measured. These were the subjective risk of infection, the experienced lack of knowledge about the Ebola virus disease and feelings of social isolation. Each outcome was adapted from the questionnaire developed by Imai et al. [20] and was measured with two items. For example, one of the items assessing social isolation was: "I felt I was avoided by others" and one of the items assessing subjective risk of infection was: "I felt anxious about being infected with Ebola". Responses were scored on a 4-point Likert Scale with response options ranging from "never" (0) to "always" (3). Sum scores ranged from 0 to 6, with higher scores indicating more concerns and worries related to the risk of an Ebola infection. The item wordings given in [20] were translated into German. Additionally, we used standard measures of symptom severity; these were the Somatic Symptom Scale SSS-8 [21], the Generalized Anxiety Disorder scale GAD-7 [22,23], the depression module of the Patient Health Questionnaire PHQ-9 [24–27], and the fatigue subscale of the Functional Assessment of Chronic Illness Therapy FACIT [28]. We also measured mental and bodily global health with two items, and categorical items regarding occupation, marital status or living environment to assess inter-group comparability.

Statistical analysis

We compared the HrQoL of the three quasi-experimental groups to test our first hypothesis: First, the comparison between internal medicine and Ebola patient treatment (groups 1 and 2) isolated the effect of contact with the Ebola pathogen on HrQoL, keeping patient contact constant. Second, the comparison between Ebola patient treatment and research laboratory (groups 2 and 3) isolated the effect of patient contact on HrQoL, keeping contact with the Ebola pathogen constant. We report mean comparisons (Tukey HSD) between groups for the primary outcomes of physical and mental components of HrQoL and infection-related concerns, clinical symptom severity, and the global health ratings as the secondary outcomes.

Given the numbers of eligible staff in the three groups and an assumed response rate of 75%, we could detect an outcome effect size of at least $d = 0.61$ for the two-tailed comparisons between groups (1) and (2) with an alpha level of 5% and statistical power of 80%. For the comparison between groups (2) and (3) the same alpha level and power could detect an effect size of at least $d = 1.08$. If we assume the response rate to be 50% the effect sizes which could be detected with the current experimental design increase to $d = 0.75$ and $d = 1.33$, respectively. Therefore, given the limited numbers of eligible staff, the experimental design was only sensitive for strong statistical effects.

We tested the second hypothesis regarding the predictors of HrQoL with two regression analyses with physical and mental aspects of HrQoL as criteria. Each regression followed a two-step approach: first, in the base model, well-established predictors such as age, sex and occupation were included as predictors of the HrQoL component. Second, in the full model, the hypothetical predictors relating to the subjective risk of infection, the experienced lack of knowledge about the Ebola virus disease, experienced social isolation and fatigue were included in the regression. Tests for significant increases in explained variance (F-tests) and tests for the contributions of single predictors (t-tests) were reported.

Results

A total of 86 staff contributed data to the statistical analysis. Sample sizes and response rates were 42 staff (54%) for group (1) from internal