

## Special Article - Ebola Virus Disease

## Clinicians Attitudes to Emerging Infections

Khan MW<sup>1\*</sup>, Solano T<sup>2</sup> and Solano M<sup>3</sup><sup>1</sup>Liverpool Hospital, Sydney, Australia<sup>2</sup>Westmead Hospital, Sydney, Australia<sup>3</sup>University of Sydney, Sydney, Australia**\*Corresponding author:** Montaha W Khan, Liverpool Hospital, Sydney, Australia**Received:** May 04, 2016; **Accepted:** June 13, 2016;**Published:** June 14, 2016**Abstract**

**Introduction:** Emerging infectious diseases like Severe Acute Respiratory Syndrome, Middle Eastern Respiratory Syndrome and the rapid spread of previously contained infections like Ebola provide challenges to management. The present study examines attitudes to such diseases using the recent Ebola epidemic to understand clinicians' concerns, attitudes and behaviours when treating patients with an emerging infectious disease.

**Design:** Participants completed an online survey. Intensive Care (ICU) and Infectious Disease (ID) trainees and specialists were invited to complete the survey. The survey covered topics including the risks, investigations and treatments applicable in managing a patient with a new infectious disease without available effective treatments.

**Results:** Overall, 150 participants completed the survey.

The number of ICU clinicians who would not delegate at risk contact with patients (43/92) was statistically significantly higher than for ID clinicians (16/58) ( $p < 0.0194$ ).

If hypothetically available treatment had 50%, 75% and 95% efficacy, there was no statistically significant difference between the groups in delegating at risk contact to other staff members.

The percentage of ICU participants who responded that patients with Ebola should be managed in the ICU ward (51/92) was statistically significantly higher than for the ID cohort (21/58) ( $p < 0.0379$ ).

Several clinical parameters were examined including Intravenous Fluids (IV), enteral and parenteral feeding, renal replacement therapy, Non-Invasive Ventilation (NIV), intubation, surgery and Cardiopulmonary Resuscitation (CPR). Overall, 53 participants (35%) would provide CPR for an irreversible condition that could also have major implications to other staff members.

**Conclusion:** The present study demonstrates that emerging infectious diseases could lead to diverse attitudes to treatment across medical subspecialties, and highlights issues such as risk perception and appropriate resource allocation.

**Introduction**

The West African Ebola outbreak, which began in 2014 and is still occurring today, is the largest outbreak of its kind seen. To date, it has infected approximately 28,000 people with over 11,000 deaths, many involving healthcare workers [1]. Cases involving returned travellers and subsequent local spread in western countries have occurred, causing substantial international concern and media attention [2]. Efforts to prepare for returned travellers potentially infected with Ebola have resulted in the accelerated development of local protocols and equipment, particularly personal protective equipment [3].

Pathways for the clinical management of patients have been developed. Issues regarding the risk of transmission to healthcare workers have resulted in local and publicised debates. Studies currently published examine the ability of clinicians to recognise Ebola and the attitudes of both medical students and clinicians on appropriate personal protection [4,5].

The present survey examines the attitudes of both Intensive Care

(ICU) and Infectious Disease (ID) clinicians in managing patients with emerging infectious diseases that have no effective specific treatment, using Ebola as an example. The results provide important insights into the effects of a non-familiar disease process on other staff and patients, while also exploring risk perception and resource allocation.

**Methods****Design**

The survey was performed in Australia and New Zealand during 2015. The Australian and New Zealand Intensive Care Society email list and an Australian ID online forum were used to distribute the survey. The survey was anonymous and voluntary with no incentive offered to participate. It was developed after discussion with a group of clinicians and trialled on a small number of clinicians before being distributed. Invitations were sent by email and the questionnaire could be accessed through a provided link on [www.surveymonkey.com](http://www.surveymonkey.com). The mail lists of clinicians were sourced from professional bodies and private mail groups.

**Table 1:** Participants preference in limiting contact to Ebola patients.

	ICU specialist	ICU advanced trainee	ID specialist	ID advanced trainee	Total
Participants in survey	78	14	49	9	150
Participants who would not restrict access to the patient ( $p>0.279$ )	38	6	28	5	77
Participants who would not delegate at risk contact with the patient ( $p<0.0194$ )	35	8	12	4	59
Participants who would delegate at risk contact to registrars ( $p<0.0379$ )	4	0	8	0	12
Participants who would delegate at risk contact to junior medical staff ( $p<0.740$ )	1	0	1	0	2

**Table 2:** The survey examined the effects of treatments with varying efficacy on the group of 73 individuals who would not delegate any at risk contact with Ebola patients.

	ICU specialist	ICU advanced trainee	ID specialist	ID advanced trainee
If there was treatment with 50% efficacy, those who would now delegate at risk contact	3	0	2	0
If there was treatment with 75% efficacy, those who would now delegate at risk contact	4	0	0	0
If there was treatment with 95% efficacy, those who would now delegate at risk contact	11	1	2	2

**Table 3:** Participants preference on the team who should primarily manage patients with Ebola.

	ICU specialist	ICU advanced trainee	ID specialist	ID advanced trainee
ICU primary team responsible ( $p>0.1$ )	51	9	23	7
ID primary team responsible	28	5	28	2

## Participants

A total of 150 participants completed the survey, including 78 ICU specialists, 14 ICU advanced trainees, 49 ID specialists and 9 ID advanced trainees. Each individual responded to the link provided via email. Participants were provided with an overview of the project followed by the survey questions. IP addresses of participants were logged during the survey, which ensured that no duplicate responses were analysed.

## Questionnaire

The survey covered topics including the risks, investigations and treatments a clinician would be prepared to undertake in treating a patient with Ebola. Several interventions were examined including Intravenous (IV) fluids, enteral and parenteral feeding, renal replacement therapy, Non-Invasive Ventilation (NIV), intubation, surgery and Cardiopulmonary Resuscitation (CPR). A total of 20 questions were asked.

## Statistical analysis

The data obtained was analysed using Chi-square tests in Excel (Microsoft Corporation; Version 2013) to identify similarities and differences in Ebola management between ID and ICU departments. All participants were included in these analyses. Chi-square test analyses were chosen because each survey item was binary. Consequently, further tests of correlation between survey items were not conducted. Statistical significance was judged at the  $p<0.05$  level, which is justified because the survey in effect had only a 2-point scale.

## Results

### Section 1-Attitudes to Ebola

The initial component of the survey considered what risks participants would take in general when treating a patient with Ebola. It asked whether they would personally oversee the management of patients or delegate at risk contact to other staff members.

As shown in (Table 1), 77 out of 150 participants (51%) would not restrict access to patients with Ebola. Forty nine percent of ICU specialists would not restrict contact with patients. However, 47% of ICU staff specialists would personally oversee management of these patients and would not allow other staff members to have access to the patient.

The results from the ID specialists revealed 75% of specialists would not restrict any staff from contact with infected patients. However, unlike the ICU specialists, a smaller number (25%) would personally oversee the management of these patients.

The ID trainees were more likely than the ICU trainees were to allow access of others to Ebola patients; however, this result was not statistically significant.

Overall, no difference was observed between ICU clinicians (44/92) and ID clinicians (33/58) in allowing access to Ebola patients.

A higher percentage of ICU specialists (38/78) responded that they would not delegate management of Ebola patients compared to ID specialists, who were more willing to delegate management ( $p<0.0194$ ).

Similarly, ICU trainees were less likely to delegate management (6/14) than the ID trainees (5/9) and even though statistically significant ( $p<0.04$ ), few trainees overall would delegate management.

The study attempted to assess whether the participants decision to delegate at risk contact would change if there were a hypothetical treatment available with 50%, 75% or 95% efficacy (Table 2).

If there were a hypothetical treatment available with efficacy of 50% or 95%, a further 3.8% and 14% of ICU specialists, respectively, would be willing to delegate at risk contact to other staff members. Furthermore, 5% would now delegate at risk exposure to advanced trainees. Of the ID specialists, 4% would now be willing to delegate

**Table 4:** Participants preference on the location where Ebola patients should be managed.

	ICU specialist	ICU advanced trainee	ID specialist	ID advanced trainee
ICU (p<0.0379)	42	9	14	7
Isolation room on the ward (p <0.0379)	13	3	21	1
Isolation room in ED awaiting transfer to another facility (p>0.9)	21	2	14	1

**Table 5:** Participants choice of appropriate investigation and treatment modalities.

	ICU specialist Response rate- 76/78	ICU advanced trainee Response rate- 13/14	ID specialist Response rate- 47/49	ID advanced trainee Response rate- 8/9
IV fluids	76	13	47	8
Enteral nutrition	76	13	45	8
Parenteral nutrition	61	10	43	8
Frequent measurement of biochemistry via a point of care device	62	11	42	8
NIV	30	8	38	8
Intubation	66	12	39	7
Invasive haemodynamic monitoring in the case of shock	67	12	37	6
Haemodynamic support with inotropes or vasopressors	73	12	42	7
Renal replacement therapies	64	10	34	7
Investigations such as computerised topography scan/ magnetic resonance imaging	33	12	30	7
Insist on interventional radiology or surgery if the patient would benefit from additional aggressive measures to achieve haemostasis	30	7	23	6
CPR	20	7	20	6
Defibrillation to an amenable arrhythmia (ventricular tachycardia or ventricular fibrillation)	56	12	38	6

at risk contact with the patient. Of this, 16% would delegate care to advanced trainees.

ID and ICU clinicians both disagreed that they would delegate care if available treatment had 50%, 75% and 95% efficacy, with only 16 out of 73 participants saying that they would delegate with treatments of 95% efficacy. There was no statistically significant difference between the groups.

ICU (27%) and ID (29%) specialists would use additional precautions such as power ventilator suits when intubating such patients.

## Section 2-Management of Ebola

The survey assessed participants responses as to who they thought the primary managing team should beand the locations where Ebola patients should be managed.

From the total participants, 58% indicated that ICU should be the primary team responsible, while 42% selected ID (Table 3).

Of the participants, 46% stated that Ebola patients should be managed in the ICU, whilst 28% indicated an isolation room on the ward. Twenty six percent identified an isolation room in the Emergency Department (ED) awaiting transfer to another facility as an appropriate location (Table 4).

The percentage of ICU specialists (51/92) who responded that patients with Ebola should be managed in the ICU ward was statistically significantly higher (p<0.0379) than that of the ID cohort (21/58).

ICU clinicians (16/92) were more likely to disagree that Ebola patients should be managed in an isolation room in a general (non-ICU) ward compared to ID clinicians (22/58; p<0.0379); however, both departments disagreed with this proposal overall.

## Section 3-Limitations of therapy

The survey examined what interventions would be appropriate in patients infected with diseases such as Ebola that lack specific treatment. Of the total participants, 100% would provide IV fluids, 99% would allow enteral nutrition and 86% would provide patients with total parenteral nutrition if required. Eighty eight percent agreed to frequent measurement of biochemistry via a point of care device.

Eighty six percent of participants would intubate Ebola patients if required; however, only 57% of participants would provide NIV. Ninety three percent of participants would offer inotropes/vasopressors, but only 85% would insert invasive hemodynamic monitoring such as arterial lines. Eighty percent of total participants would provide renal replacement therapy if clinically indicated.

The survey observed that 57% of total participants would be agreeable to investigations such as computerised topography scans/magnetic resonance imaging. Forty six percent of individuals would insist on aggressive measures such as interventional radiology or surgery if it were deemed beneficial to the patient. Furthermore, 76% of participants would approve of defibrillation of an amenable arrhythmia (ventricular tachycardia or ventricular fibrillation) but only 37% of individuals would provide CPR if a cardiac arrest occurred (Table 5).

## Discussion

The emergence and rapid spread of new or poorly understood diseases such as Ebola highlights the concerns raised by lack of diagnostic and treatment options.

Previous studies on the Severe Acute Respiratory Syndrome epidemic have examined the effects on healthcare providers. Profound effects including increased stress, work avoidance and negative effects on activities outside of work were apparent. This included healthcare workers who were not directly involved in the care of infected patients but who were working in hospitals that cared for other patients [6,7]. A large survey in Germany examining the general population's attitudes to Ebola found that there could be negative effects on individuals [8]. However, this survey specifically focused on clinicians who would be directly involved in the care of infected patients.

Other issues such as the quarantine of staff is problematic. Staff should have adequate facilities; however, there are studies that have shown that staff that are not quarantined are more likely to complete their professional duties. If there are insufficient staff who are willing to personally oversee the management of infected patients, then recruiting staff to the ICU might be required, which is clearly challenging [9,10]. Such effects on staff members might be one reason why clinicians attempt to minimise staff contact with patients. In the present survey, 59 of total participants (39%) would not delegate at risk contact with patients. Another study examined the effects of emerging respiratory diseases on healthcare workers [11]. Both these studies agree that this issue needs to be addressed, which could be through risk reduction strategies that include educating staff and making appropriate equipment such as personal protective equipment available.

The present survey provides information regarding health professionals and risk perception. The survey demonstrated 74 participants (49%) deemed that patients with Ebola were too high risk to have contact with other staff members. If there were a treatment with efficacy greater than 50%, 25 participants (34%) would not restrict access to the patient. Risk reduction measures were further illustrated by 54% of participants preferring to manage infected patients in an isolation room. The existing infrastructure of the hospital as well as the economic feasibility of physical isolation determines whether the infected patient can be treated in a physically separate ICU or in an isolated ward [12].

Studies have shown risk perception is not necessarily related to knowledge. This was illustrated in a previous study of health professionals who were aware of the effectiveness of vaccinations against certain pathogens but had a low rate of individual vaccinations [13]. In another study, only 70% of healthcare workers took appropriate HIV precautions in their daily work with patients; however, extra precautions were taken with patients known to have HIV. This did not reduce the transmission of infections [12,14]. This issue has been clearly illustrated in the present study, where 38 of the total participants (25%) would only feel comfortable intubating Ebola patients with powered respirators even though there is no evidence that supports the effectiveness of such precautions. Another published study examined the risk of Ebola perceived by internists and the individual preparedness to communicate risk to patients

[15]. The present study examined risk using a unique approach by asking participants how their interactions with infected individuals would change based on varying degrees of an efficacious therapy, and elaborated on what interventions a clinician is prepared to undertake for such patients. This has not been examined before in previous studies. The differences demonstrated between the ID and ICU groups are related to the clinicians having diverse experiences and differing training pathways in becoming specialists. The present study demonstrates that ICU clinicians are more willing to take a direct, hands-on approach to managing diseases that have significant risk of transmission to staff. Even though these departments often work closely together, they are exposed to a different case mix of patients. Furthermore, differences demonstrated between the specialist groups may reflect issues of familiarity with aggressive supportive treatments, and management of the critically ill.

Finally, the present survey highlights another important issue of careful allocation of limited medical resources while trying to maximise health benefits to as many patients as possible. Previous studies have shown that limited ICU bed availability affects the admission of patients and the length of their stay [16]. With an emerging infection like Ebola, which has no effective specific treatment, an issue arises as to whether these patients should be admitted to an ICU where there is risk of transmission of the infection to other critically ill patients and staff. This may be one of the reasons 46% of participants in the survey would not admit these patients to an ICU. Healthcare associated infections are a global issue affecting staff and patient safety [16,17]. The present survey highlights some interesting aspects of resource utilisation. As expected, relatively inexpensive and non-invasive therapies were recommended by most participants, if clinically indicated, such as IV fluids (100%). However, if the patient developed complications from Ebola that had high mortality rates and required intubation or use of vasopressors, 89% and 95% of participants, respectively, would offer such therapies. Moreover, if the patient had a cardiac arrest, 38% of participants would provide CPR. These results show how clinicians might be attempting to provide cost effective therapies in such settings, including infection control to prevent spread of the virus and simple supportive measures such as IV fluid and electrolyte replacement. These measures are instituted until the immune system mobilises an adaptive response to eliminate the infection [18,19].

A case report from Germany described an Ebola patient who developed complications, including gram-negative sepsis, respiratory failure and encephalopathy. With appropriate ICU care, including aggressive resuscitation and mechanical ventilation, the patient had a full recovery [20]. Even though this creates an ethical issue for not treating patients who may otherwise have a full recovery, every case must be carefully considered and balanced against the risk of infecting other staff and patients [21].

The findings of the present survey have limitations. The expressed attitudes are from clinicians working in regions where there was no incidence of Ebola. In addition, the questions asked in the survey are based on common interventions available in a resourceful well-equipped ICU, and the questions asked were not peer reviewed. Finally, the questions asked were closed ended and consequently only limited information could be obtained.



In summary, emerging infectious diseases have a major impact on all levels of healthcare. Patient safety must remain of utmost importance but it is also important to identify the consequences on other individuals. The present survey examined the attitudes of clinicians in managing patients with a new infectious disease, highlighting important issues such as the effect on staff and other patients, risk perception and allocation of limited resources. The survey results also demonstrate some of the differences in attitudes across medical subspecialties.

## References

- Chretien JP, Riley S, George DB. Mathematical modeling of the West Africa Ebola epidemic. *Elife*. 2015; 4.
- Frieden TR, Damon I, Bell BP, Kenyon T, Nichol S. Ebola 2014 new challenges, new global response and responsibility. *N Engl J Med*. 2014; 371: 1177-1180.
- Ebola Virus Disease (EVD): Personal Protective Equipment and Other Ebola-Related Supplies, UNICEF. 2016.
- Holakouie-Naieni K, Ahmadvand A, Raza O, Assan A, Elduma AH, Jammeh A, et al. Assessing the Knowledge, Attitudes, and Practices of Students Regarding Ebola Virus Disease Outbreak. *Iran J Public Health*. 2015; 44: 1670-1676.
- Kobayashi M, Beer KD, Bjork A, Chatham-Stephens K, Cherry CC, Arzoaquoi S, et al. Community Knowledge, Attitudes, and Practices Regarding Ebola Virus Disease-Five Counties, Liberia, September-October, 2014. *Centers for Disease Control and Prevention*. 2015; 64: 714-718.
- Khee KS, Lee LB, Ong TC, Loong CK, Ming CW, Kheng TH. The psychological impact of SARS on health care providers. *Crit Care Shock*. 2014; 7: 99-106.
- Tam CW, Pang EP, Lam LC, Chiu HF. Severe Acute Respiratory Syndrome (SARS) in Hong Kong in 2003: stress and psychological impact among frontline healthcare workers. *Psychol Med*. 2004; 34: 1197-1204.
- Rübsamen N, Castell S, Horn J, Karch A, Ott JJ, Raupach-Rosin H, et al. Ebola risk perception in Germany, 2014. *Emerg Infect Dis*. 2015; 21: 1012-1018.
- Smith CB, Battin MP, Jacobson JA, Francis LP, Botkin JR, Asplund EP, et al. Are there characteristics of infectious diseases that raise special ethical issues? *Developing World Bioeth*. 2004; 4: 1-16.
- Gostin LO, Bayer R, Fairchild AL. Ethical and legal challenges posed by severe acute respiratory syndrome: implications for the control of severe infectious disease threats. *JAMA*. 2003; 290: 3229-3237.
- Koh Y, Hegney D, Drury V. Comprehensive systematic review of healthcare workers' perceptions of risk and use of coping strategies towards emerging respiratory infectious diseases. *International Journal of Evidence-Based Healthcare*. 2011; 9: 403-419.
- Gomersall CD, Tai DY, Loo S, Derrick JL. Expanding ICU facilities in an epidemic: recommendations based on experience from the SARS epidemic in Hong Kong and Singapore. *Intensive Care Med*. 2006; 32: 1004-1013.
- Dinelli MI, Moreira Td, Paulino ER, da Rocha MC, Graciani FB, de Moraes-Pinto MI. Immune status and risk perception of acquisition of vaccine preventable diseases among health care workers. *Am J Infect Control*. 2009; 37: 858-860.
- Jovic-Vranes A, Jankovic S, Vukovic D, Vranes B, Miljus D. Risk perception and attitudes towards HIV in Serbian health care workers. *Occup Med (Lond)*. 2006; 56: 275-278.
- Ganguli I, Chang Y, Weissman A, Armstrong K. Ebola Risk and Preparedness: A National Survey of Internists. *J Gen Intern Med*. 2016; 31: 276-281.
- Stelfox HT, Hemmelgarn BR, Bagshaw SM, Gao S, Doig CJ, Nijssen-Jordan C, et al. Intensive care unit bed availability and outcomes for hospitalized patients with sudden clinical deterioration. *Arch Intern Med*. 2012; 172: 467-474.
- Zimlichman E, Henderson D, Tamir O, Franz C, Song P, Yamin CK, et al. Health Care-Associated Infections: A Meta-analysis of Costs and Financial Impact on the US Health Care System. *JAMA Intern Med*. 2013; 173: 2039-2046.
- Fowler RA, Fletcher T, Fischer WA 2<sup>nd</sup>, Lamontagne F, Jacob S, Brett-Major D, et al. Caring for critically ill patients with ebola virus disease. Perspectives from West Africa. *Am J Respir Crit Care Med*. 2014; 190: 733-737.
- Chertow DS, Kleine C, Edwards JK, Scaini R, Giuliani R, Sprecher A. Ebola virus disease in West Africa--clinical manifestations and management. *N Engl J Med*. 2014; 371: 2054-2057.
- Kreuels B, Wichmann D, Emmerich P, Schmidt-Chanasit J, de Heer G, Kluge S, et al. A case of severe Ebola virus infection complicated by gram-negative septicemia. *N Engl J Med*. 2014; 371: 2394-2401.
- Solano T, Gilbert GL, Kerridge IH, Nayyar V, Berry A. Ethical considerations in the management of Ebola virus disease. *Med J Aust*. 2015; 203: 193-195.