

## **Ebola Virus Disease and Ethics: A Mercy Approach**

### ***Mercy Corporate Ethics Committee***

Prepared by Mary E. Homan, MA, MSHCE, Director, Ethics, Mercy West Communities

October 2014

The 2014 Ebola outbreak is the largest in history and the first in West Africa. While the outbreak does not pose a significant risk to the United States today, every health care entity should, based on best, current knowledge, ensure that it can detect a patient with Ebola, protect healthcare workers so they can safely care for the patient, and respond in a coordinated fashion. To that end, the Mercy Corporate Ethics Committee has identified common scenarios and questions that may arise and wishes to provide this document as guidance for leaders to help guide our co-workers in responding to those who are vulnerable and scared by the unknown.

Guided by Catherine McAuley's courage of providing care for patients during the cholera epidemic in Ireland, we are called to replicate her dedication to her patients and Sisters. We believe by equipping our co-workers with the necessary physical equipment as well as emotional, spiritual, and ethical support, we can promote the safety and care of our patients and co-workers. By relying on our core values of Dignity and Justice we will surely be faithful to the heritage entrusted to us by the Sisters of Mercy.

This white paper from the Mercy Corporate Ethics Committee will lay out two major categories: duty to care and duty to protect others. Both categories will contain common questions/situations and an ethics response. The ethics rationale for those responses will appear in Appendix A. It should be noted that Ebola Virus Disease in the United States is not entirely comparable to pandemic<sup>1</sup> but that much of the research performed related to pandemic influenza and other disasters brings credible evidence to the manner in which EVD could be addressed from an ethics perspective.

### **GUIDING VALUES AND CONCEPTS**

Our Mercy core values of Dignity and Justice as well as the principle of the Common Good, as understood within our Catholic moral and social traditions, underpin each of the responses given to questions related to Ebola and guide our decisions. All three are consistently used in Catholic healthcare and express key themes in our theological tradition.

#### *Dignity*

We cherish each person as created in the image and likeness of God. The first right of the human person, the right to life, entails a right to the means for the proper development of life, such as adequate health care. We should be responsive to the dignity of all persons including our co-workers, patients, and visitors by:

- Serving patients and their families with the compassion of Christ, sensitive to their vulnerability at a time of special need (ERD 2).
- Being transparent to our patients, visitors, and co-workers while always respecting the privacy and confidentiality of the patients whom we serve.
- Treating each patient as a unique person of incomparable worth, with the same right to life and to adequate health care as all other persons.

### *Justice*

We pledge to be in right relationships with one another, with particular concern for the economically poor. “Justice is essentially relational, and it includes at once both a recognition of the individual’s dignity and an acknowledgment of the rights and responsibilities of individuals and society” <sup>2(p22)</sup>.

- Encouraging dialogue to promote right relationship.
- Working to “ensure protection for the fundamental rights of all individuals” <sup>3(secPreamble)</sup>. This includes appropriate training and equipment to both support and safeguard our co-workers and to provide the highest quality healthcare to best serve those who entrust themselves to our care.

### *Common Good*

The common good refers to “the social conditions that allow people to reach their full human potential and to realize their human dignity” <sup>4(p10)</sup>. The common good “implies then that individual citizens and intermediate groups are obligated to make their specific contributions to the common welfare”<sup>5(no53)</sup>.

Mercy is committed to serving the common good of society and will work to protect the well-being of all of its patients by:

- Protecting from discrimination those whose ability to pay or whose social condition places them in the so-called margins of society.
- Enacting standards of care that work to the betterment of Mercy’s patient and service population ministry-wide.
- Using resource allocation processes that do not arbitrarily disadvantage any particular patient, patient group, ministry site, or community.
- Striving to ensure burdens are not borne disproportionately by any patient, patient group, ministry site, or community.
- Being concerned for the well-being of our healthcare providers and their family members, along with our patients and our local communities<sup>6(p233)</sup>.

## I. A DUTY TO CARE

### A. Co-worker Responsibilities

1. **Question:** What is the obligation of leadership to provide personal protective equipment for co-workers who may potentially have to treat a patient with Ebola?
  - a. **Ethics Response:** Leaders have a duty to obtain proper personal protective equipment and provide training for clinical staff who will be ministering to a patient <sup>7(p260)</sup>.
2. **Question:** Due to the added strain of treating high-risk patients, should some co-workers be additionally compensated for their duties?
  - a. **Ethics Response:** As persons will be tasked with working longer hours and exposed to more high-risk contaminants, benefits, e.g. premium pay, alternative housing, are ethically justifiable.
3. **Question:** Are there differing obligations for clinical staff than non-clinical staff? What if a co-worker refuses to treat or provide non-clinical services to a patient with confirmed Ebola?
  - a. **Ethics Response:**
    - i. All patients have inherent dignity; therefore first, and foremost, all co-workers are obligated to serve patients and families “with the compassion of Christ, sensitive to their vulnerability at a time of special need”<sup>3(no2)</sup>.
    - ii. Physicians have a professional obligation to use their skills for patients with highly infectious diseases such as EVD. The same is true of nursing staff, however, the standard is not generally viewed as obligatory to the same degree.
      - An “opt-in” process is preferable but there may come a time when there are not enough clinicians to treat a patient.
        - It would be ethically justifiable to assign clinical staff to a patient who have had sufficient training and expertise to treat a patient regardless of their desire\* to participate in such care <sup>7(p260),8(p8)</sup>.
    - iii. Non-clinical co-workers do not retain this same obligation; therefore certain provisions, e.g. refusal to work, should be reassessed in human resources policies.
      - An “opt-in” process for volunteer with special training and extra compensation and benefits may be offered.
4. **Question:** Can a pregnant or breastfeeding co-worker be on the treatment team for a patient with confirmed Ebola?
  - a. **Ethics Response:** The safety and well-being of these co-workers should be addressed by infection prevention specialists.
    - i. Women who are pregnant or breastfeeding should not automatically be excluded from participation on the treatment team of a patient with Ebola.
    - ii. However, co-workers who are pregnant or breastfeeding should be allowed a reasonable accommodation of being assigned to a different patient or work area.

## B. Patient Care Issues

1. **Question:** What sort of treatment should a patient with Ebola receive? What if they're really sick and not expected to recover?

a. **Ethics Response:**

- i. Patients with Ebola should receive all medical measures and experimental interventions including intensive/critical care <sup>9</sup>.
  - ii. The presumption and benefit of resuscitation should be evaluated in light of a patient with Ebola who has uncontrolled bleeding, risk of hypoxic brain injury or anoxia for patients not yet intubated, as well as risk to staff regarding emergent line placement, intubation, etc.
    - If the patient or surrogate does not agree to a do-not-resuscitate order that is medically indicated, a unilateral DNR order would seem justifiable<sup>9</sup>.
  - iii. We should honor the inherent dignity of all person recognizing, however, when resources become scarce, transitioning from the principle of beneficence to nonmaleficence and to triage on the basis of the greater good may be morally justified <sup>7(p261)</sup>. The triage officer (supervisory physician), not the attending physician should make the decision about resource allocation within the guidelines of the local health department and with the support of local ethics resources.
2. **Question:** What if a patient comes in with advanced symptoms of Ebola and is really sick? Do they have to pursue aggressive treatment? What if they come in moderately sick; do they have to do everything?

a. **Ethics Response:** A patient has an obligation to use ordinary treatment where the benefits of the treatment outweigh the burdens of the treatment (ERD 56). A person may decide not to pursue treatment that does not offer reasonable hope of benefit or is excessively burdensome (ERD 57).

3. **Question:** What if a patient with Ebola is really struggling and we know the death is inevitable. Can we help them not suffer so much?

a. **Ethics Response:** Medicine's task is to care even when it cannot cure (ERDs, Part V, Introduction). We have an obligation to keep patients as pain-free as possible, however, we cannot intentionally hasten a patient's death even if they or their surrogate request assistance in dying (ERD 60). Instead we should offer good palliative care which includes pain and symptom management.

4. **Question:** How do we assist patients with confirmed EVD and their families to attend to their pastoral and spiritual needs?

a. **Ethics Response:**

- i. Pastoral services should work with the patient and/or loved ones to prepare for honoring the dignity of the patient even after death.
- ii. Pastoral services co-workers, priests or other ministers normally should not enter the patient's room.
- iii. Engaging in a ritual with loved ones and connecting with the patient via telemedicine technologies is an option.
- iv. Given risk of transmission, reception of the Holy Eucharist on the tongue as well as intinction are discouraged <sup>10(p26)</sup>.
- v. "[C]onfession and absolution can be given without the need for physical contact with any person"<sup>10(p3)</sup>.

5. **Question:** Aren't the bodies of patient with confirmed EVD still contagious? Must a body be cremated?
  - a. **Ethics Response:** Persons should be able to prepare for death and we should be mindful of religious and cultural considerations. Cremation is not the only option.

## II. A DUTY TO PROTECT OTHERS

1. **Question:** Where will a patient with confirmed Ebola Virus Disease receive treatment?
  - a. **Ethics Response:** Patients with confirmed EVD may be transferred to a State or CMS-designated facility if feasible to best protect both the EVD patients and the ability of the Mercy facility to continue to serve the local community.
2. **Question:** What if a patient responds "yes" to screening questions but refuses treatment? Can they leave against medical advice?
  - a. **Ethics Response:** Adequate scripting, including behavior recommendations for front-line/triage co-workers should be provided to deescalate a situation wherein a patient refuses to participate in their care or attempts to leave. Given that a patient has sought treatment and that they may pose a significant public health threat if left undiagnosed or treated, it would be ethically justifiable to detain a patient until local health officials or law enforcement assume responsibility.
3. **Question:** How do we balance transparency with a patient's right to privacy and confidentiality?
  - a. **Ethics Response:**
    - i. We have an obligation to protect the privacy and confidentiality of our patients and we also have a duty protect the well-being of our Mercy co-workers and the larger community. Deferring to the judgment of the local public health officials regarding release of information, beyond that which the patient has consented for, seems reasonable.
    - ii. Mercy has an obligation to be transparent with the community about training of staff, our ability to treat a potential patient with EVD, and what the general plan is for a patient currently being treated for EVD, e.g. holding and transferring to higher level facility.
4. **Question:** What are the ethics issues surrounding a pregnant patient with confirmed Ebola? What are the ethically acceptable options?
  - a. **Ethics Response:**
    - i. A pregnant woman with confirmed Ebola should receive compassionate support about the probable loss of her child. Consider use of telemedicine capabilities to access pastoral services, including an outside entity requested by the patient.
    - ii. Given that the current clinical recommendation is to only provide vaginal delivery for a pregnant patient with Ebola, special considerations of an incomplete vaginal delivery must be considered. While the survivability of an infant following delivery is nearly nil, this does not mean that a pregnancy may be voluntarily terminated.
5. **Question:** Can a Mercy clinical co-worker who "moonlights" at another facility and has treated a patient with Ebola at another facility be allowed to participate on a treatment team of a Mercy patient?
  - i. **Ethics Response:** This is ultimately a question for infection prevention. Recognizing the varying reasons a co-worker may provide care at other facilities, including financial reasons, it would be unjust prima facie to deny them work.

- One possibility, if approved by infection prevention, is that if a co-worker tests negative for Ebola, to place them in a non-patient care role while being monitored as per infection prevention guidelines. Alternatively, if infection prevention deems any presence at work to be a risky behavior, the co-worker might be justly compensated for lost time as determined by human resources.

## APPENDIX A: ETHICS RATIONALE

### I. A Duty to Care

#### A. Co-worker Responsibilities

1. Not only is there an obligation to provide appropriate equipment (ERD 7), researchers have found in other pandemic studies, there is an increased likelihood to report to work when there was “perceived capacity to communicate effectively, perceived importance of one’s role in the agency’s overall response, and familiarity with one’s role specific response in an emergency” <sup>11,12(p553)</sup> which would include personal protective equipment, mitigation of harm, etc.
2. “Employers contracting in advance with all HCWs and promising additional compensation, social support and prioritized access to preventive and treatment resources on an individualized basis is a key strategy for countering workers’ preferences to not work.” <sup>13(p22)</sup>.
  - “It is never ethically appropriate to add to the burden of the most vulnerable members of any society. If low status workers do not receive a fair share of their society’s benefits, it is not fair to tell them they have a professional or civic duty to do dangerous work” <sup>14(p11)</sup>.
3. “Stigmatization can lead to prejudicial treatment and/or ostracization of those known or suspected to be infected” <sup>15(p705)</sup>.
  - There are different obligations regarding co-worker participation in the care for a patient with confirmed Ebola. “Doctors and nurses have a greater obligation of beneficence than most others...[because] health care professionals have a proportional greater ability (than the public) to provide care; professionals, in choosing their professions, have assumed the risks of providing care; and the professions are legitimated by their contracts with society, resulting in the obligation of professionals to be available in times of emergency” <sup>7(p258)</sup>.
  - Ethics will defer questions about conscience protections to experts in those areas as related to law and human resources. “The individual should be free to follow a well-formed conscience, but ultimately, Catholic health care is guided by the teachings of Jesus, who has called us to live in accord with the light of truth” <sup>16(p35)</sup>.
  - \*Immunocompromised <sup>7(p260)</sup> co-worker: Taking precedent from policy MHC-IC-ID-0023 Infection Control - Infectious Disease - HIV Policy, “Immunocompromised employees may be reassigned to care for patients not suffering from immunosuppression and/or HIV infection” the same standard could be ethically applied to immunocompromised co-workers and a patient with Ebola.
4. “As a general rule pregnant HCWs should be able to care for most patients, even those with infectious processes” <sup>17(p22)</sup>.
  - This is an issue of justice wherein if a person is deemed safe-to-work and appropriate precautions are taken as per infection prevention, while they should be mindful their decision to work may put at risk the woman and the child, it would be an exercise of paternalism to deny them the right to work based on any other criteria.

## B. Patient Care Issues

1. Pandemic influenza experts have proposed that “some patients will be removed from ventilators without their consent or the consent of a surrogate, in the interest of giving other patients with equivalent claims to these scarce resources a fair chance to survive” <sup>14(p9)</sup>. “Limited resources, such as ventilators, dialysis, or even the services of limited health care personnel can be allocated licitly to those who have the best chance of benefiting from those resources” <sup>7(p262)</sup>. An Ethics Consultation is recommended in such cases.
  - If multiple patients are encountered, e.g. a pandemic, then triage guidelines take over and there will be separate ethics recommendations and clinical frameworks to assist decision-making.
2. “A person has a moral obligation to use ordinary or proportionate means of preserving his or her life. Proportionate means are those that in the judgment of the patient offer a reasonable hope of benefit and do not entail an excessive burden or impose excessive expense on the family or the community” <sup>3(no56)</sup>. “A person may forgo extraordinary or disproportionate means of preserving life. Disproportionate means are those that in the patient’s judgment do not offer a reasonable hope of benefit or entail an excessive burden, or impose excessive expense on the family or the community” <sup>3(no57)</sup>.
3. “Euthanasia is an action or omission that of itself or by intention causes death in order to alleviate suffering. Catholic health care institutions may never condone or participate in euthanasia or assisted suicide in any way” <sup>3(no60)</sup>.
4. “Catholic health care institutions offering care to persons in danger of death from illness, accident, advanced age, or similar condition should provide them with appropriate opportunities to prepare for death. Persons in danger of death should be provided with whatever information is necessary to help them understand their condition and have the opportunity to discuss their condition with their family members and care providers. They should also be offered the appropriate medical information that would make it possible to address the morally legitimate choices available to them. They should be provided the spiritual support as well as the opportunity to receive the sacraments in order to prepare well for death” <sup>3(no55)</sup>.
5. The Centers for Disease Control and Prevention state that “[r]emains should be cremated or buried promptly in a hermetically sealed casket”<sup>18</sup>.

## II. A DUTY TO PROTECT OTHERS

1. We have an obligation to provide the safest care possible for a patient with confirmed Ebola Virus Disease as well as ensure the safety of other patients. Transferring a patient to a higher level of care to receive treatment, including palliative care or hospice, from those appropriately trained for longer term services is ethically tenable. Ensuring the safety of our other patients, especially in smaller facilities factors into this recommendation as well.
2. While an emergency department may have a policy that allows for a patient to, for example, “make the decision to leave before a medical screening exam has been done or refuse further medical treatment” (MHC-PC-ED-0093 Emergency Department-Refusal of Treatment) given the severity of exposure to other persons, a patient with suspected Ebola would not be allowed to leave against medical



advice (AMA) or refuse further screening and/or monitoring. They would be able to determine if they wanted to pursue aggressive or palliative measures.

- Critics have asserted that a narrow reading of the Emergency Medical Treatment and Labor Act (EMTALA) would allow a hospital to “release a patient with an infectious disease who is stable with ensuring that the patient will receive adequate follow-up care”<sup>19(p211)</sup>. This recommendation ensures that such an action is ethically unacceptable.
3. “Health care providers are to respect each person’s privacy and confidentiality regarding information related to the person’s diagnosis, treatment, and care”<sup>3(no34)</sup>.
- Precedent with regards to HIV has been established in that Our current policy “The identity of an individual infected with HIV [or] a person suspected of being infected with the HIV virus shall not be revealed to anyone other than those who need to know. Any breach of confidentiality by any employee or agent of this institution shall be grounds for disciplinary action, including the possibility of termination...Employees will not discuss any aspect of the diagnosis and treatment of the patient infected with HIV with any family, friends, or significant others **for whom the patient has not authorized disclosure**” (emphasis added) (MHC-IC-ID-0023 Infection Control - Infectious Disease - HIV Policy).
  - Bending the rules regarding privacy seems ethically justifiable given how worried the American public is <sup>20</sup>.
  - This recommendation takes into account the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 which “permits the secretary of the Department of Health and Human Services to waive sanctions for violations of EMTALA during a declared public health emergency”<sup>19(p212)</sup>.
4. Limited evidence suggests that pregnant women are at increased risk for severe illness and death when infected with Ebola virus” <sup>21(p3)</sup>. Additionally, spontaneous abortion (miscarriage) is frequent in women with Ebola <sup>21(p5),22(p2),23(ps11)</sup>.
- “Abortion (that is, the directly intended termination of pregnancy before viability or the directly intended destruction of a viable fetus) is never permitted. Every procedure whose sole immediate effect is the termination of pregnancy before viability is an abortion...” <sup>3(no45)</sup>. However, “Operations, treatments, and medications that have as their direct purpose the cure of a proportionately serious pathological condition of a pregnant woman are permitted when they cannot be safely postponed until the unborn child is viable, even if they will result in the death of the unborn child” <sup>3(no47)</sup>. An ethics consultation should be placed for any pregnant patient with confirmed Ebola.
  - “Virtually nothing is known about the clearance of Ebola virus from breast milk in convalescing women” <sup>21(p4)</sup> therefore it will be at the discretion of the clinician to recommend breastfeeding if a child survives delivery. Alternatively, accessing a community’s milk bank seems a reasonable solution to be promoted to the mother.

5. Work can be the ordinary way most people meet their material needs but it may be more than a way to make a living; it is a way persons express themselves and contribute to the common good<sup>24</sup>.
  - “One should take precautionary infection control measures in circumstances in which one knows that he or she has been, or might be, infected with a transmissible disease” <sup>15(p706)</sup>. “[T]he extent of precaution (aimed at the prevention of infection of others) required should be proportional to (1) the likelihood that one has him-or herself been infected and (2) the extent to which the disease in question is deadly or otherwise dangerous” <sup>15(p707)</sup>.

## REFERENCES

1. Tuohey JF. A matrix for ethical decision making in a pandemic. The Oregon tool for emergency preparedness. *Health Prog. St. Louis Mo* 2007;88(6):20-25.
2. O'Rourke KD, Boyle P. *Medical Ethics: Sources of Catholic Teachings*. Washington, DC: Georgetown University Press; 2011.
3. United States Conference of Catholic Bishops. *Ethical and Religious Directives for Catholic Health Care Services, Fifth Edition.*; 2009. Available at: <http://www.usccb.org/issues-and-action/human-life-and-dignity/health-care/upload/Ethical-Religious-Directives-Catholic-Health-Care-Services-fifth-edition-2009.pdf>.
4. Byron WJ. Ten Building Blocks of Catholic Social Teaching. *America* 1998;179(13):9-12. doi:Article.
5. Pope John XXIII. Pacem in Terris. 1963. Available at: [http://www.vatican.va/holy\\_father/john\\_xxiii/encyclicals/documents/hf\\_j-xxiii\\_enc\\_11041963\\_pacem\\_en.html](http://www.vatican.va/holy_father/john_xxiii/encyclicals/documents/hf_j-xxiii_enc_11041963_pacem_en.html). Accessed May 5, 2011.
6. Mukherjee JS, Farmer PE. Infectious diseases. In: Levy BS, Sidel VW, eds. *Social Injustice and Public Health*. 2 edition. Oxford ; New York: Oxford University Press; 2013:220-237.
7. Hilliard M. Triage and the duty to care. In: Furton E, Cataldo PJ, Moraczewski AS, eds. *Catholic Health Care Ethics: A Manual for Practitioners*. 2nd ed. Philadelphia PA: National Catholic Bioethics Center; 2009:257-264.
8. Malm H, May T, Francis L, Omer S, Salmon D, Hood R. Ethics, pandemics, and the duty to treat. *Am. J. Bioeth.* 2008;8(8):4-19.
9. Fins JJ. Responding to Ebola: Questions about resuscitation. *Bioeth. Forum* 2014. Available at: <http://www.thehastingscenter.org/Bioethicsforum/Post.aspx?id=7135&blogid=140#ixzz3GGWuNzHs>. Accessed October 16, 2014.
10. Vitillo RJ. *Response to Ebola Virus Disease (EVD): Guidelines for Planning and Provision of Pastoral and Social Support Services*. Caritas Internationalis; 2014:29.
11. Balicer RD, Omer SB, Barnett DJ, Everly GS. Local public health workers' perceptions toward responding to an influenza pandemic. *BMC Public Health* 2006;6:99. doi:10.1186/1471-2458-6-99.
12. Devnani M. Factors associated with the willingness of health care personnel to work during an influenza public health emergency: an integrative review. *Prehospital Disaster Med.* 2012;27(6):551-566. doi:10.1017/S1049023X12001331.
13. Vawter D, Garrett J, Prehn A, Gervais K. Health care workers' willingness to work in a pandemic. *Am. J. Bioeth.* 2008;8(8):21-23.
14. Berlinger N, Moses J. *The Five People You Meet in a Pandemic—and What They Need from You Today*. The Hastings Center; 2007:14.

15. Selgelid MJ. Infectious Diseases. In: Ruth Chadwick, ed. *Encyclopedia of Applied Ethics (Second Edition)*. San Diego: Academic Press; 2012:704-711. Available at: <http://www.sciencedirect.com/science/article/pii/B9780123739322001149>. Accessed August 9, 2013.
16. Kopaczynski G. Conscience. In: Furton E, Cataldo PJ, Moraczewski AS, eds. *Catholic Health Care Ethics: A Manual for Practitioners*. 2nd ed. Philadelphia PA: National Catholic Bioethics Center; 2009:31-35.
17. Mirza A, Wyatt M, Begue RE. Infection control practices and the pregnant health care worker. *Pediatr. Infect. Dis. J.* 1999;18(1):18-22.
18. Centers for Disease Control and Prevention. Guidance for safe handling of human remains of Ebola patients in U.S. hospitals and mortuaries. *Ebola Ebola Virus Dis.* 2014. Available at: <http://www.cdc.gov/vhf/ebola/hcp/guidance-safe-handling-human-remains-ebola-patients-us-hospitals-mortuaries.html>.
19. Parmet WE. *Populations, Public Health, and the Law*. Washington, D.C: Georgetown University Press; 2009.
20. Caplan A. Five ethical points now that Ebola has entered The USA. *Forbes* 2014. Available at: <http://www.forbes.com/sites/arthurcaplan/2014/09/30/five-ethical-points-now-that-ebola-has-entered-to-the-usa/>. Accessed October 17, 2014.
21. Jamieson DJ, Uyeki TM, Callaghan WM, Meaney-Delman D, Rasmussen SA. What obstetrician-gynecologists should know about Ebola: A perspective from the Centers for Disease Control and Prevention. *Obstet. Gynecol.* 2014. doi:10.1097/AOG.0000000000000533.
22. Jeffs B. A clinical guide to viral haemorrhagic fevers: Ebola, Marburg and Lassa. *Trop. Doct.* 2006;36(1):1-4. doi:10.1258/004947506775598914.
23. Mupapa K, Mukundu W, Bwaka MA, et al. Ebola hemorrhagic fever and pregnancy. *J. Infect. Dis.* 1999;179(s1):S11-S12. doi:10.1086/514289.
24. United States Catholic Conference Domestic Policy Committee. A fair and just workplace: Principles and practices for Catholic health care. *Origins* 1999;29(12):182-188.