Int Marit Health
2011; 62, 4: 262–265
www.intmarhealth.pl

ISSN 1641–9251

VIA MEDICA

ORIGINAL PAPER

The challenge and prevention of epidemics Experience from offshore petroleum installations and its extrapolation to ships

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ABSTRACT

The risk of epidemics represents an important challenge in offshore petroleum activities. All personnel are needed for regular operations, and the outbreak of an epidemic will soon affect the operations. The economical consequences can be vast. The risk of an epidemic is raised due to the closeness of living and catering offshore combined with frequent changes of personnel who travel offshore from many nations. The article is based on the experience gained by the author during 22 years as a senior medical officer in a Norwegian oil company. Some endemics and epidemics are described. None of these resulted in the shutdown of production, but they still represented a major challenge to the company and to the medical staff in particular. The transfer value from experience offshore to ships is obvious but there are differences. Risk analysis and quality assurance systems play an important part in the prevention and limitation of epidemics offshore. The infrastructure of the food supply chain as well as education and training of personnel are key elements. Campaigns on different hygiene topics that address all personnel are launched at regular intervals. Contingency plans must be established and be ready for use in case of a threatening epidemic. Identification of the type and source of the infection or food poisoning, isolation of the infected personnel, safe evacuation of patients, and the establishment of other necessary barriers for reduction of spread of infection are necessary to control an outbreak of an epidemic.

(Int Marit Health 2011; 62, 4: 262–265)

Key words: Infections, epidemics, hygiene, offshore, risk assessment

INTRODUCTION

This article is based on the experience gained by the author during 22 years as a senior medical officer in a Norwegian oil company.

The number of installations rose from zero to more than 20 during this period. The number of personnel on board varied among the installations from around 20 up to 300. Most of them were large with a crew of more than 150. The number of personnel varied according to time of year, because maintenance and major modifications took place during the summer season, and also varied depending on activities like drilling operations and oil-well interventions. All transport was by helicopter from Norway and the personnel were multinational and multicultural. The majority were Norwegian.

OFFSHORE VERSUS SEAFARING

The offshore personnel work for 2 weeks 12 hours a day followed by 3 or 4 weeks leave. This implies a high risk of bringing infections offshore. Ship crews are generally smaller, stay on board for longer per-

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iods, and shore leave is restricted in time and therefore they can be considered a more isolated community. Both in seafaring and offshore the crew are multinational, and therefore the patterns of infections will vary more than in a land based community.

According to Norwegian regulations every offshore petroleum installation has a doctor who is responsible for health care and hygiene relating to food, catering, and epidemics. On board a ship the master has the similar responsibility, despite limited training in this field.

Offshore there are generally high standards of hygiene, accommodation, medical facilities and equipment.

The corresponding standards on ships vary and the medical facilities and equipment are limited. On every offshore installation there are one or two registered nurses, and onshore there is a doctor on 24/7 duty. On a ship the first mate is responsible for medical activities, and when necessary he seeks advice via telemedical assistance services. The offshore nurses have education and training in hygiene and take part in special courses in food and drinking water hygiene. Norwegian navigational officers on ships are only offered 1–2 hours on these topics during their education.

The offshore medical services have, together with the catering staff, developed special regimens and contingency plans to handle and to limit the spread of epidemics. On board a ship the presence of such regimens and contingency plans are exceptional.

Many professional cooks and members of the catering staff offshore have been shown to lack sufficient knowledge, understanding and to have attitudes to hygiene and safe practices that did not assure the optimal hygienic standard. It was realised that the knowledge from their education had faded and follow up education and training had to be established. The corresponding standards in seafaring vary widely between high hygienic standards on cruise ships and substandard approaches on some small coasters. Patients can easily be evacuated from offshore to hospitals onshore, and personnel can be sent offshore for medical assistance or replacement of sick personnel within 1.5–3 hours depending on weather conditions and distance. A ship will most often have to rely on its own scarce resources, and evacuation and replacement of crew may be impossible within 2–5 days.

ENDEMICS AND EPIDEMICS EXPERIENCED OFFSHORE

Seasonal influenza occurs two or more times a year. This can be explained by multinational personnel bringing their seasonal influenza offshore. An influenza epidemic offshore seems to behave similarly to one onshore despite the crew living and working closely together and does not represent a major challenge.

Norovirus causes a few epidemics each year, normally only 10 to 15 persons are affected. This may be due to efficient isolation regimens and the rapid launch of hygienic contingency procedures [1].

Shigella from green salad from Spain caused an epidemic affecting more than 70 persons. This epidemic caused major operational consequences and the drilling operations were stopped. The patients could not be transported onshore due to excessive and urgent diarrhoea.

Hepatitis A was brought offshore by an employee not working in the catering department and a total of 9 persons were infected. One patient became seriously ill. The offshore installation was isolated for many days and the media attention represented a challenge to the operators. Effective contingency plans came into action based on close collaboration with the health authorities [2].

Impetigo affected 10 persons in one drilling department. This kind of epidemic infection in unusual among adults. The outer ear was affected in all patients. The source of infection was shown to be a telephone headset. This endemic presented challenges in relation to disinfection of telephones, headsets, hearing protection devices, and survival suits and how to regulate helicopter transportation for patients suffering from infections.

Highly active sputum positive tuberculosis of the lung was diagnosed in a patient who had been working 2 periods of 14 days each on many offshore installations while being contagious. More than 3000 offshore workers underwent chest X-rays and were tested by Pirquet/Mantoux. There were no secondary infections found [3].

METHODS FOR PREVENTING EPIDEMICS OFFSHORE AND ON SHIPS

RISK ASSESSMENT

Risk assessment is a key element in all matters related to health, safety and environment, and their findings provide the best basis for proactive decisions and actions.

Risk assessment should be performed at regular intervals. The length of the interval should be assessed as part of the risk assessment and the other parts of the quality assurance system [4].

In the context of epidemics, the risk assessment should include the following:

The infectious agents: the different relevant agents should be identified while taking into account the multinational supply of crew, food, and water. What is the source of the different agents? Do they spread via droplets, direct skin contact, faecal/oral, body fluids, vectors, water, or contaminated food? What is the replication rate under different conditions, the incubation period, the possible production of toxins and the severity of the resulting sickness including long-term consequences?

The human factors: the human factor is very important in relation to the initiation and spread of epidemics and food poisoning. The level of relevant knowledge among those in the chain of food supply must be assessed and maintained at the level necessary for safe practice. Even the use of professional cooks does not assure the necessary quality needed for the safe supply, storage, production, and handling of food. The attitude and behaviour of personnel in relation to personal hygiene, professional hygiene, and their role in the spread of epidemics represent a major risk factor.

The organisational factors: the company policy and continuing awareness regarding hygiene and epidemics must be assessed. Are the quality assurance systems adequate and functioning? These should include standards and procedures for competence, hygiene, monitoring, reporting of non-compliance, internal audits, GAP-analyses, corrective measures, and verification.

The infrastructure factors: the standard of facilities for storage, production, serving, and treatment of food, drinking water, and leftovers of food must be assessed. This includes freezer, refrigerator and counter surfaces and temperature, water storage tanks, disinfection and control of drinking water, the facilities for the separation of different food supplies and products, the availability of cutlery to avoid contamination, and barriers to avoid trespassers entering the chain of food supply. The availability and feasibility of personal equipment feasible to avoid contamination from employees is also important. The standard and availability of cabins, toilets, showers, laundry, towels, soap and the routines and procedures for cleaning must also be assessed.

The human costs: the consequence of an infection can vary from minor discomfort to serious sickness resulting in long-term sick leave with or without chronic sequelae, reduction of quality of life, or even to death. It is very important to include these consequences in the risk assessment. Another important aspect is the individual costs resulting is the possible suspicion, assumption, or confirmation that one or more individuals are responsible for the epidemic because of lack of procedures or infrastructure, improper production or handling of food, or being the source of the infectious agent. There are examples of individuals committing suicide in such situations.

The economical costs and operational consequences: epidemics can affect key-personnel and result in major operational consequences, delays, and even deviation of a ship. A ship can be denied access to a harbour because of infections/epidemics on board. This may result in major costs and loss of revenue. Necessary healthcare, isolation, tracing of source, and measures needed for normalisation will significantly add to the costs.

The safety consequences: epidemics may hit vital personnel positions and can lead to a non-functioning installation/ship where safety and seaworthiness faces a threat [5].

The stakeholders: epidemics can cause delay of cargo delivery that in turn may lead to economical consequences for the customer. The next of kin may also be affected and the social security for the seafarer and his family may suffer seriously if the employee is disabled for long periods of time, is permanently disabled, or dies. The company will suffer from economical losses that may affect its stock market valuation. Relations with clients, investors, employees, governmental bodies, community, media, and others can be affected.

The reputation and prequalification: serious epidemics with operational consequences will cause news headlines and influence the companies health and safety statistics, and this may damage the reputation and affect their ability to prequalify for new contracts or renew existing ones.

QUALITY ASSURANCE

Hygienic acceptance criteria: detailed and measurable criteria must be defined. Qualified personnel must be included in this process.

Inspections and audits: internal inspections and audits must be performed at regular intervals. The length of the intervals should be assessed as part of the risk assessment and the quality assurance system. Qualified personnel must be included in these processes.

GAP-analysis: the possible GAP between the criteria and the present state should be worked out and serve as a basis for further actions.

Conclusions, decisions, and actions: the GAP--analysis will define necessary actions to be taken, but the decisions are left to be taken by the management.

Verification: every action has to be surveyed and the desired effect must be verified.

PREVENTIVE MEASURES

Infrastructure: according to risk assessment and acceptance criteria.

Standards and procedures: according to risk assessment and acceptance criteria.

Education and courses: the basic education and training on food and catering hygiene for cooks and catering staff is not sufficient to ensure the necessary knowledge, understanding, and attitude for safe practice. It is necessary to arrange courses and training at regular intervals to obtain the desired level of hygiene.

Campaigns: campaigns to increase the awareness and practice of personal hygiene and how to avoid the transfer of infective material to others are necessary.

METHODS FOR HANDLING EPIDEMICS OFFSHORE

When an epidemic is developing or becomes established additional precautions have to be taken in order to limit the spread and reduce its consequences. It is of great importance that these actions have been planned in advance and documented in contingency plans [6]. The plans have to be detailed and must include necessary procedures and informative material. The plans must be exercised and evaluated regularly. The required equipment and supplies must be in place at all times. Arrangements that give access to medical personnel for treatment and care and continuous evaluation of the situation and of the actions to be taken must be in place. Important elements in the contingency planning are as follows:

Identification of the type and source of the infection or food poisoning: the identification requires assistance from qualified personnel, and occasionally official disease control agencies must be consulted or involved.

Isolation of the infected personnel: single occupancy cabins with private toilets should be available. If not available, special cleaning procedures should be instituted. Food and drinks should be brought to the cabin by protected personnel. Special procedures should be established to take care of waste and other possible contagious material.

Medical evacuation of patients: measures should be instituted to protect personnel and equipment involved in the evacuation.

Establishing of barriers: intensified personal hygiene regimens should be instituted such as focusing on hand washing. Reduction of the spread of possible infectious material between persons by frequent disinfection of sanitary facilities, use of disposable plastic cutlery, and food offered in individual proportions or food served by catering staff instead of self service. No use of re-usable cutlery should be allowed.

Plans for treatment of patients and reactive prophylactic treatment or vaccination of exposed contacts: such plans must be part of the contingency plans and must include the supply of necessary substances [7].

Information and media handling: procedures for contact with and information to official bodies and strategies and procedures for informing and handling media must be established.

DISCUSSION

Epidemics represent a major challenge both in offshore petroleum activities and on board ships. The operational, economic, and personal consequences can be dramatic. The permanent loss of health, a shut down of oil production, or the isolation of a cruise ship are examples of worst case scenarios [8]. It is very important to assure the quality of prophylactic measures in the daily handling of food and water supplies and hygiene and to establish a contingency plan to launch in case of a threatening or an established epidemic. If not, the treat of a serious epidemic is high and the handling will have to be based on improvisation.

REFERENCES

1. Donaldson EF, Lindesmith LC, Lobue AD, Baric RS. Norovirus pathogenesis: mechanisms of persistence and immune evasion in human populations. Immunol Rev 2008; 225: 190–211.
2. Kosatsky T., Middaugh J.P., Hall D. Outbreak of hepatitis a on an offshore petroleum platform, Alaska. West J Med 1988; 148: 163–166.
3. Gensini GF, Yacoub MH, Conti AA. The concept of quarantine in history: from plague to SARS. J Infect 2004; 49: 257–261.
4. Riddle MS, Smoak BL, Thornton SA, Bresee JS, Faix DJ, Putnam SD. Epidemic infectious gastrointestinal illness aboard U.S. Navy ships deployed to the Middle East during peacetime operations — 2000-2001. BMC Gastroenterol 2006; 25: 9.
5. Hansen HL, Henrik Andersen P, Lillebaek T. Routes of M. tuberculosis transmission among merchant seafarers. Scand J Infect Dis 2006; 38: 882–887.
6. Schlaich C.C., Oldenburg M., Lamshöft M.M. Estimating the risk of communicable diseases aboard cargo ships. J Travel Med 2009; 16: 402–406.
7. Idnani N. Varicella among seafarers: a case study on testing and vaccination as a cost-effective method of prevention. Int Marit Health 2010; 61: 32–35.
8. Davies JW, Simon WR, Bowmer EJ, Mallory A, Cox KG. Typhoid at sea: epidemic aboard an ocean liner. Can Med Assoc J. 1972; 106: 877–883.