

The 5th Mathew Lukwiya Memorial Lecture

Prevention and Control of Infectious Disease Transmission within the Health Care Setting

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Introduction

Emerging infectious diseases have increased world wide in the past two decades. In 1957 and 1968, new strains of influenza emerged in China and spread rapidly around the globe. During the 1970s, new diseases that included Ebola were identified. Then came HIV/AIDs and TB (including multidrug-resistant strains. The SAARs epidemic and now there are speculations of a looming threat of an influenza pandemic.

The burden of emerging and re-emerging infectious diseases is likely to increase due to:

- global travel,
- globalization,
- population growth, increased urbanization and crowding,
- population movements from civil wars, famines, man-made or natural disasters,
- irrigation, deforestation, and reforestation projects that alter the habitats of disease carrying insects and animals
- human behaviours, such as intravenous drug use and risky sexual behaviour
- Increased use of antimicrobial agents and pesticides, hastening the development of resistance
- Increased human contact with tropical rain forests and other wilderness habitats that are reservoirs for insects and animals that harbour unknown infectious agents

Irrespective of what ever emerges, or when it emerges, the health care professionals are and will always remain on the frontline, thereby making them more vulnerable as demonstrated during the numerous past outbreaks where many HCWs got infected and quite a number died. Yet world wide, there is a general shortage of doctors, nurses and all the other cadres of health care professionals.

In Uganda the Doctor Patient ratio is 1:24,725. Table 1 below provides an analysis of actual number of staff and minimum staffing Norms for all GOU and private not for profit health facilities.

Table 1: Analysis of Actual Number of Staff and Minimum staffing Norms . All GoU and PNFP Health Facilities

| | GoU: HC2-GH | | | PNFP: HC2-GH * | | | RH No. | | | Total Districts (GoU/PNFP) & RH | | |
|--------------------------|-------------|--------|--------|----------------|--------|--------|--------|-------|--------|---------------------------------|--------|--------|
| | Act | nom | Gap | Act | nom | Gap | Act | nom | Gap | Act | nom | Gap |
| Clinical | 1,319 | 1,474 | -155 | 436 | 762 | -326 | 168 | 347 | -179 | 1,923 | 2,583 | -660 |
| Medical | 308 | 304 | 4 | 305 | 334 | -29 | 164 | 346 | -182 | 777 | 984 | -207 |
| Midwives | 1,635 | 798 | 837 | 914 | 1,540 | -626 | 312 | 369 | -57 | 2,861 | 2,707 | 154 |
| Nursing | 2,542 | 5,254 | - | 1,915 | 2,908 | -993 | 758 | 922 | -164 | 5,215 | 9,084 | -3,869 |
| | | | 2,712 | | | | | | | | | |
| Total Medical / Clinical | 5,804 | 7,830 | -2,026 | 3,570 | 5,544 | -1,974 | 1,402 | 1,984 | -582 | 10,776 | 15,358 | -4,582 |
| Nursing Assistants | 4,165 | 2,606 | 1,559 | 2,005 | 2,190 | -185 | 175 | 203 | -28 | 6,345 | 4,999 | 1,346 |
| Diagnostic | 356 | 1,208 | -852 | 358 | 529 | -171 | 79 | 145 | -66 | 793 | 1,882 | -1089 |
| Pharmacy | 76 | 266 | -190 | 43 | 126 | -83 | 29 | 67 | -38 | 148 | 459 | -311 |
| Other medical related | 988 | 1,322 | -334 | 126 | 203 | -77 | 63 | 138 | -75 | 1,177 | 1,663 | -486 |
| Other staff | 1,627 | 866 | 761 | 3,052 | 3,193 | -141 | 462 | 869 | -407 | 5,141 | 4,928 | 213 |
| | 13,016 | 14,098 | -1,082 | 9,154 | 11,785 | -2,631 | 2,210 | 3,406 | -1,196 | 24,380 | 29,289 | -4,909 |

From the table above, the gap in the staffing Norms is still high. While there is a plan by the MoH to increase the staffing norm from the current 68% of filled positions to 90%, we need to work jointly to protect the existing available staff and avoid losing them from preventable conditions as it happened during the Ebola outbreak 2000 – 2001.

Globally, there seems to be an increasing evidence of an impending, critical shortfall in health care professionals willing to work in deprived areas. As in most countries, many of the health care professionals in Uganda tend to be concentrated in the capital city or in big towns, where they can easily make a livelihood and where the socio-economic factors are more favorable. For example, because of the insurgency, poor living conditions, limited access to social services (e.g education) in the northern part of Uganda, most qualified health professionals are reluctant to serve the very needy population that are poor and yet thronged with a multitude of ill health. In the BMJ Vol 323 of 25 August 2001, Young and Leese was able to illustrate that the supply of general practitioners in a given area in the United Kingdom was a reflection of differences in local living and working environments and that difficulties are greatest in deprived urban areas.

This is the trend globally. The late Dr Mathew Lukwiya was, however, one of those exceptional persons, who by his own choice, declined many lucrative career paths abroad and stayed on to serve in an unpopular area (Gulu) that is afflicted by multiple deprivations (war, guerrilla activities that has displaced more than 60% of the population into camps, destruction, sicknesses etc).

Nosocomial and Occupational infections of HCWs

Nosocomial (health facility acquired) infections

The term "nosocomial" comes from two Greek words: "nosus" meaning "disease" + "komeion" meaning "to take care of." Hence, "nosocomial" should apply to any disease contracted by a patient while under medical care. It is synonymous with hospital acquired infections to patients, and caregivers (including the health care professional).

A nosocomial infection is specifically one that was not present or incubating prior to the patient being admitted to the hospital, but occurred within 72 hours after admittance to the hospital. If someone in a hospital slips and breaks their hip, could that be a nosocomial fracture of the femur? No way. The only things that are nosocomial are infections! Hence, Nosocomial infections are generally defined as;

An infection acquired in the hospital by a patient who was admitted for a reason other than that infection (1). An infection occurring in a patient in a hospital setting or other health facility in whom infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility (2).

Despite progress in public health and hospital care, infections continue to develop in hospitalized patients and also affect hospital staff. Some of the infections are endemic and probably silent, while others are of outbreak tendency, affecting many people and health personnel within a short period of time. Occupational infections of hospital staff may be due to a variety of reasons that may include:

- Heavy work load leading to accidental exposures
- Poor infection control practices

- Increasing variety of medical procedures and invasive techniques creating potential routes of transmission

Since antibiotics have come into common usage, bacteria that are resistant to them have also become common, especially in hospitals, so there are now lots of nosocomial infections, the burden of which is not exactly estimated in Uganda.

Occupational exposure and occupational infection

An occupational exposure is an accident associated with exposure to blood, bloody fluids or other body fluids. Modes of exposure include percutaneous injuries (needle stick injuries, injuries from contaminated sharps) mucous membrane exposures, non-intact skin exposures, and bites.

An occupational exposure may place a healthcare worker at of risk numerous infections that include Hepatitis B, Hepatitis C, HIV, and VHF's which are associated with significant emotional, physical and financial consequences, and sometimes death.

Occupational infections are therefore infections contracted via employment mode.

Nosocomial and occupational infections occur as a result of three factors occurring in tandem:

- High prevalence of infectious agents
- Presence of susceptible hosts
- Efficient mechanism of transmission (from patient to patient, or from patient to HCWs)

Risks of nosocomial and occupational infections of HCWs

Nosocomial and occupational infections occur worldwide and affect both developed and resource-poor countries. Endemic and silent nosocomial and occupational infections are sometimes difficult to determine as compared to outbreaks of nosocomial and occupational infections. Table 2 below is a summary of outbreaks of Ebola and resulting occupational infections among HCWs.

Table 1: Summary of outbreaks of Ebola and resulting occupational infections of HCWs

| Outbreak | Country | No. cases | No. deaths | CFR | No. Medical staff infected | % HCW / cases |
|-------------------------|----------------|------------------|-------------------|------------|-----------------------------------|----------------------|
| Yambuku 1976 | DRC | 318 | 280 | 88% | 13 | 4% |
| Nzara 1976 | Sudan | 70 | 34 | 49% | 3 | 4% |
| Tandala 1977 | DRC | 1 | 1 | 100% | 0 | 0% |
| Nzara 1979 | Sudan | 34 | 22 | 65% | 2 | 6% |
| Cote d'Ivoire 1994 | Cote d'Ivoire | 1 | 0 | 0% | 0 | 0% |
| Mékouka 1994 | Gabon | 52 | 31 | 60% | 0 | 0% |
| Mayibout 1996 | Gabon | 33 | 23 | 70% | 0 | 0% |
| Booué 1996 | Gabon | 60 | 45 | 75% | 2 | 3% |
| Mékambo Mbomo 2001-2002 | Gabon Congo | 124 | 97 | 78% | 4 | 3% |
| Olloba 2002 | Congo | 16 | 10 | 63% | 0 | 0% |
| Kéllé 2003 | Congo | 143 | 128 | 90% | 3 | 2% |
| Mbandza Mbomo 2003 | Congo | 35 | 29 | 83% | 1 | 3% |
| Yambio 2004 | Sudan | 17 | 7 | 41% | 3 | 18% |
| Etoumbi 2005 | Congo | 12 | 10 | 83% | 0 | 0% |
| Maridi 1976 | Sudan | 214 | 117 | 55% | 73 | 34% |
| Kikwit 1995 | DRC | 315 | 254 | 81% | 80 | 25% |

| | | | | | | |
|-----------|--------|-----|-----|-----|-----|-----|
| Gulu 2001 | Uganda | 425 | 224 | 53% | 29 | 7% |
| Total | | 954 | 595 | | 182 | 19% |

This is just the tip of the iceberg as there are many other occupational infections, sometimes leading to death, but are not well documented

The recent SARS outbreak claimed **Dr. Carlo Urbani**, a WHO expert on communicable diseases who first detected and reported the existence of the new infectious disease that later became known as SARS. He contracted the deadly virus while treating patients and died on 29 March, 2003 in Bangkok, Thailand. Apart from the index patient, all the patients who died in the Vietnamese outbreak were doctors and nurses. In Hong Kong, 25 percent of patients with SARS were health care professionals (including the chief executive of the hospital authority).

Dr Aniru Conteh, was in-charge of the world's only isolation unit for Lassa fever, located in Sierra Leone and was indeed the worlds best expert on Lassa fever. While treating a Lassa fever patient, he pricked himself with a needle 17 March, 2004, and became infected with the Lassa virus. He died from Lassa fever on 6 April, 2004 leaving his wife, three sons and two daughters.

We are all aware of Mrs Lucille Corti, who contracted HIV/AIDs while caring for patients at Lacor Hospital, and ended up being one of the Martyrs. She died in 1996.

The burden of nosocomial and occupational infections is definitely high, the list may be endless, many of which are not documented due to a number of factors that include lack of infection surveillance, ignorance etc.

We should also remember that while the focus of today,s lecture is occupational infection, it is highly related to nosocomial transmissions to patients as well.

Consequences of occupational infection of HCWs

Occupational infections of health care professionals will ultimately progress to clinical disease, disability or death depending on the nature of the pathogen, thereby resulting in a number of negative consequences. Some of the consequences of occupational infection of the HCWs include:

Functional disability and emotional stress of HCWs

Hospital acquired infections add to functional disability and emotional stress of the affected HCWs, and may sometimes lead to disabling condition that reduce the quality of life.

Physical absence

The death of a health care professional would result in loss of professional skills, institutional knowledge, and service to community, mentoring of junior colleagues, interruption of team structure etc. Every death of a health care professional leaves the health system more deprived than before, and this hampers the achievement of the millennium development goals.

Increased costs

Some of the infections may lead to hospitalization and prolonged stay in the hospital leading to increased direct costs and indirect costs due to lost work. Hospital acquired infections add to the imbalance between resource allocation for primary and secondary health care by diverting scarce funds to the management of potentially preventable conditions.

Scaring away patients and the public

Patients and the general public have a lot of faith in the health care professionals to the extent that most believe that they never fall sick! When suddenly, they see nurses and doctors being admitted, then they tend to get so scared. Some run away to other health facilities, usually taking with them and spreading the etiologic agent, thereby compounding the problem. During the 1976 Ebola outbreak in DRC, HCWs were even attacked by the local population because they were perceived to be the source of the outbreak.

Fear in fellow colleagues

The other health care professionals tend to get scared and loose morale when they see their fellow colleagues' succumb to some mysterious illness that they contracted from their patients.

Exacerbation of staffing needs

The doctor -patient ratio or nurse patient ratio is very low in almost all African countries, and is even lower in disadvantaged and deprived areas. As a result, many of the HCWs work for long hours and are stretched beyond their limits. When they suddenly become ill and probably patients in their own wards, then the staffing needs even gets worse as it is usually very difficult to get other staff to perform the duties they were performing. There is a plan to increase the current staffing norm in Uganda from 68% to 90%. Any death of HCWs resulting from occupational infection will ultimately compromise the achievement of this target.

Economic loss to health system and immediate family members

The economic loss to health system includes the investment cost in educating the health care professional and the investment return or gains that would have been achieved if this health care professional worked until the retirement age. A study conducted on the cost of health professionals' brain drain in Kenya estimated the cost of educating a single medical doctor from primary to university level at US\$ 65,997 and that of educating one nurse from primary to para-medical level at US\$ 43,180, which is about the same cost in Uganda. The death of a health care professional from occupational infection before their retirement age would imply economic loss from the capital investment in educating them, the loss of skills developed and the income they generate for their family members.

Usually, the health care professional die leaving behind their spouse, children, and other extended family with a very huge gap in family support, as they are most times, the main stay of family income.

Infection Control programmes

Prevention of nosocomial and occupational infections of HCWs is the responsibility of all individuals and service providers providing health care. The HCWs need not only work to reduce transmission of infections to patients but to themselves as well. Infection control programmes are effective as long as they are comprehensive; include surveillance, prevention and control

activities, as well as staff training. It is equally important to have District and national support. In Uganda, occupational health programmes is part of the HSSP II and decentralization of resources and activities facilitates implementation at all levels of health care. Important programmatic levels include:

National Programmes

It is important that the MOH develop national programme to help hospitals and other health care facilities in reducing the risk of nosocomial and occupational infections. Such programmes should:

- Set national objectives consistent with other national health care objectives;
- Develop and continually update guidelines for infection surveillance, prevention and control;
- Develop a national system to monitor the burden of nosocomial and occupational infection and assess the effectiveness of interventions;
- Harmonize training programmes for HCWs country wide;
- Facilitate access to materials and products essential for hygiene and safety; and
- Establish a framework to monitor nosocomial and occupational infections , with feed back to HCWs.

The current HSSP II gives focus on occupational health activities but does not clearly spell out activities for nosocomial infection control, and this needs to be accorded some thoughts as they are inter-related.

Hospital programmes

Major preventive efforts should be at hospitals and other health care facilities. Risk prevention to staff should be of primary concern, and must be supported at senior administrative level. Hospitals need to provide sufficient resources to support:

- Promotion of good health care;
- Protection of the service providers;
- Appropriate isolation;
- Appropriate sterilization and other practices;

- Staff training; and
- Epidemiological surveillance.

Hospitals need to establish infection control committee that is multidisciplinary. The infection control committee could be tasked with:

- Review and approval of yearly programme of activity for surveillance and prevention;
- Review surveillance data and identify areas for intervention;
- Assess and promote improved practice at all levels of the health facility;
- Ensure appropriate staff training in infection control and safety;
- Review risks associated with new technologies and monitor infectious risks of new devices;
- Review and provide input into investigation of occupational infections of HCWs; and
- Communicate and cooperate with other committees.

The infection control team is responsible for oversight and coordination of all infection control activities to ensure an effective programme.

Infection Surveillance, Prevention and Control in Health Care settings

The untimely deaths of Dr Carlos Urbani, other health care professionals from SARS in Vietnam; of Dr Mathew Lukwiya and other Medical personnel that perished during the Ebola outbreak in Uganda; and of all the other medical personnel that have died in previous outbreaks in DRC, Gabon etc, is a graphic reminder that members of the medical profession are on the frontline in dealing with new and emerging diseases. The frontline health workers will continue to face the greatest risk. It is important to institute effective infection surveillance, institute preventive and control activities for nosocomial and occupational infections of HCWs.

It may be necessary to do risk assessment, review existing data and information and use it to develop strategies for infection surveillance for hospital acquired infections.

Infection Surveillance

The development of a surveillance programme is a first step to identify local problems, establish priorities, and evaluate the effectiveness of infection control programmes. The surveillance system should aim to reduce nosocomial, occupational infections and their costs. Specifically, the systems should aim at:

- Improving awareness of the health care professionals about nosocomial and occupational infections and antimicrobial resistance, so that they can appreciate the need for preventive action; and
- Monitoring trends, incidence and distribution of nosocomial / occupational infections, prevalence, and if possible, the risk adjusted incidence for intra and inter-hospital comparisons.

The surveillance system should be:

- Simple to minimize costs and workload,
- Flexible to allow changes when appropriate,
- Acceptable to encourage participation of all stakeholders and key players,
- Sensitive so that cases identified are representative, and
- Specific requiring precise definitions and trained investigators.

The surveillance data should be routinely analysed, discussed, feedback provided in a timely manner, and the results acted upon appropriately.

Prevention and control of Health-care acquired infection

Prevention of nosocomial and occupational infections requires an integrated, monitored programme which includes the following components;

- Limiting transmission of infectious agents between patients through adequate hand wash, appropriate use of gloves, appropriate aseptic practice, isolation strategies, sterilization, disinfection practices and laundry services
- Controlling environmental risks for infection
- Protecting patients through appropriate use of antimicrobials, nutrition and vaccinations
- Limiting invasive procedures and promoting antimicrobial use in order to minimize risk of endogenous infections

- Infection surveillance to identify and control outbreaks
- Prevention of infection in HCWs
- Enhancing staff care practices, and continuing staff education

Risk stratification is essential to categorise patients and help plan and institute infection control programmes that is effective in protecting the HCWs and preventing nosocomial infections.

Person to person transmission can be reduced through;

- Hand decontamination
- Personal hygiene
- Use of appropriate clothes, masks and gloves
- Safe injection practices

The following can help to minimize and prevent transmission from the environment;

- Regular and appropriate cleaning of the health facility environment
- Disinfection of patient equipment
- Sterilization (thermal or chemical)
- Implement appropriate endoscope processing

Infection control precautions should include;

- Standard precautions for routine practices
- Airborne precautions for droplet infections e.g. tuberculosis, bacterial meningitis etc
- Contact precautions for patients with enteric infections, and diarrhoea or skin lesions that can not be controlled
- Strict isolation for highly virulent micro-organisms as with viral haemorrhagic fevers, SARs etc

Preventing infection of staff

HCWs are at risk of acquiring infection through occupational exposure. HCWs can also transmit infections to patients and other employees. Thus, it is important to develop a programme to prevent and manage infections in HCWs.

This program should be adapted to the local circumstances and may include;

- Immunization of staff
- Appropriate screening of staff
- Post exposure treatments where applicable
- Routine training of HCWs on infection control and monitoring implementation
- Surveillance of HCWs

The control of hospital acquired infection should start with an investigation of the cause, determine risk factors and magnitude of the problem. Depending on the outcome of the analysis, appropriate interventions should be instituted in a timely manner

Conclusion

The truth is: We will never avoid emerging and re-emerging diseases. The ultimate containment of these emerging and re-emerging diseases will depend so much on the likes of our fallen heroes like Dr Mathew Lukwiya and other colleagues, Dr Aniru Conteh, Dr Carlo Urbani, just to mention, but the few. Our Government need to build the base to create stable jobs and training opportunities, adequate physical infrastructure, and safe working environments to foster the development of local expertise and encourage the local and young physicians and other scientists to fill in the role vacated by the fallen heroes.

The more support we provide to people on the front lines, the safer and healthier are the politicians, policy makers and the general community.

We shall never forget all the health care professionals that perished during the Ebola outbreak. While our thoughts, prayers and deepest condolences go to the immediate family members, let's strive to keep alive Mathew's last prayers and wish:

"My God, my God, I will die of Ebola in my service, but I want to be the last victim" and may this not only remain true for future Ebola outbreaks, but for all outbreaks and emerging and re-emerging infections to come!

Last but not least, I would like to thank the organizers of the 5th MLML, especially Dr Sekimpi Deo, for giving me this opportunity to offer this lecture on this occasion. Lets all strive to maintain the health of the HCWs and protect the critical and inadequate resource that is highly sought for.

Ladies and gentlemen, thank you for your attention.

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