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Safety first

Everything right from the air in a hospital to the people who work there can be potential carriers of contamination. Therefore, controlling the spread of disease and minimising the number of healthcare-associated infections have become primary concerns for any healthcare facility.

In our special Infection Control Report, we highlight how the opportunity for unrelated infections to develop in hospitals and other healthcare facilities is high. It is more critical than ever for hospitals to ensure that infectious diseases do not spread.

For instance, author Ammar Widitaputra *(pg 06)* sheds light on the culture of patient safety and how it should involve leadership, teamwork and collaboration, and evidence-based practices. In fact, leaders should set patient safety as priority and motivate staff to perform and ensure that all the standards are followed, and no short-cuts are taken.

Furthermore, there are a number of diagnostic instruments and surgical tools used in the treatment of disease. This is where technology has a crucial role to play, as its right application can enhance clinician communication, improve medication safety, reduce potential medical errors and improve the overall patient experience *(pg 12)*.

Also, due importance must be given to disinfection or sterilisation of infectious laboratory and bio-hazardous wastes at the point of generation, and to find a better solution or appropriate technology for its proper management *(pg 14)*.

We hope you find the articles to be informative and enjoy reading this issue.

Deepa Narwani

Contents

Championing the cause of infection prevention and management

By Dr. Alai Taggu, Specialist – Critical Care Medicine & Chairperson of the Hospital Infection Control Committee (HICC), Aster Hospitals

The principles of infection prevention are a systematic approach based on infectious agents, epidemiology, social science and health system strengthening. It ensures patient safety and also the safety of healthcare workers, whether in a hospital set up or in community. These are broadly divided into standard and transmission-based precautions.

1. Standard precautions:

It applies to all patients to minimise the transmission of infections in healthcare settings. It is essential that standard precautions are applied at all times when caring for any patient regardless of their infectious disease status.

The practices that form part of standard precautions include:

- hand hygiene
- appropriate use of personal protective equipment (PPE)
- use of aseptic technique where required
- appropriate reprocessing of reusable instruments and equipment
- safe handling and disposal of sharps and potentially infectious material
- safe handling of waste and linen
- environmental controls including cleaning and spills management

2. Transmission-based precautions:

These are applied in addition to standard precautions for patients suspected or confirmed to be infected with specific organisms of concern and the route of transmission (airborne, droplet or contact), like isolation cubicles/ use of N95 mask respirators etc.

Public health is the science of protecting and improving the health of families and communities through promotion of healthy lifestyles, research for disease and injury prevention, and detection and control of infectious diseases.

Most of the infection prevention champions do the following:

- Lead and participate in clinics that aim to prevent or decrease infectious disease transmission.
- Assess health trends and risk factors of groups to prioritise for targeted interventions.
- Provide input to programmes that monitor, anticipate, and respond to public health problems in population.
- Work with communities or specific population groups within the community
- Participate in assessing and evaluating the healthcare needs of the public to ensure people are aware of programmes.
- Provide health education, care management, and primary care to individuals and families who are at high risk for certain infection.

All these above mentioned measures when put together as a bundle can lead to a healthier and infection free society.

Examining Central Sterile Services Department's role in patient safety

By Ammar Widitaputra, Secretary, Himpunan Sterilasi Sentral Indonesia (HISSI), Jakarta, Indonesia

CSSD process reusable instrument or medical device from all areas such as the operating theatre, wards, critical care, outpatient, endoscopy, etc.

Picture this. A patient comes home to gather with family members for an occasion such as *Eid Al Fitr* or *Eid Al Adha*. But before that a patient is given service in the hospital or any other healthcare facilities directly by the doctor, nurse or health workers. However, before the process starts, the doctor, nurse or health workers need sterile supplies provided by Central Sterile Services Department (CSSD).

CSSD process reusable instrument or medical device from all areas such as the operating theatre, wards, critical care, outpatient, endoscopy, etc. The department also sterilises supply such as gauze or linen. Even though CSSD doesn't meet the patient directly, the finish products from them are directly used by the patient. Therefore, CSSD must understand the patient safety concept thoroughly, as it supports patient safety by breaking the chain of infection.

The fundamental role of the CSSD is to receive, clean, decontaminated, packaged, and sterilised medical devices that can be distributed. These devices are reprocessed in reprocessing equipment, such as washer-disinfectors and sterilisers that are routinely maintained and validated in order to prevent cross-contamination and infection in patients. This is achieved by well-trained and knowledgeable staff working in the CSSD under the supervision of experienced and trained managers who understand and implement strategies of risk management and quality assurance.

Culture of patient safety

A culture of patient safety should be built in CSSD. Culture is defined as the deeply rooted assumptions, values, and norms of an organisation that guide the interactions of the member through attitudes, customs, and behaviour.

A culture of patient safety involves: leadership, teamwork and collaboration, evidence-based practices, effective communication, learning, measurement, a just culture, systems thinking, human factors, and zero tolerance.

Leaders in CSSD are responsible for establishing safety. Leaders set patient safety as priority and motivate staff to perform. They ensure all the standards are followed, and no short-cuts are taken.

Leaders provide tools to ensure all steps are done seamlessly. Leadership is critical to the success of patient safety in CSSD.

Decontamination process in CSSD cannot be done by one person. Teamwork and collaboration combines the talents and skills of each member of a CSSD team and serve as a check and balance method, making sure every process is done the right way. CSSD must encourage thinking, suggestion and action from all staff. Teamwork and collaboration in the department also decrease risk to staff.

Also, communication is a vital aspect. Open communication between leaders and staff or between staff encourage sharing technological and environmental information. Communication is based on mutual trust and setting the best practices in CSSD. Communication includes written, verbal, or electronic, and can be used for sharing data, sharing policies and procedures, literature studies and also reporting systems.

Sterilisation should be used for evidence-based literature. Sterilisation cannot be done only as a habit; a generation-to-generation practice has shown that people don't use evidence-based standard. Evidence based practice in CSSD is a basic element of patient safety. Evidence based guideline for CSSD best practice is available from World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and Asia Pacific Society of Infection Control (APSIC). Adoption of best practices sometimes meets resistance. Leadership together with staff must increase awareness, improve the desire to change to meet the standard, and even ask for incentives.

All members of CSSD should learn. Learning together can improve the ability to create desired results. The department's staff should encourage participating in learning the formulating policies and procedures. They can schedule monthly meetings when a group of staff presents one topic, while others pay attention and ask questions to the presenter group.

To monitor compliance with best practices and to identify gaps in care, CSSD must collect and report reliable data. The staff must collect any problem when reprocessing instrument, particularly in cleaning, disinfection or sterilisation. CSSD can also get information from users. Any report that shows lack of compliance from best practice should be analysed and managed to improve cleaning, disinfection or sterilisation practice.

All processes in healthcare facilities are systems, involving interconnected components, people, supplies and equipment. CSSD practice seems simple, however it is really complex. It needs trained technicians, facilities, supplies, and water. Systems change or system thinking should be done to achieve and sustain success in CSSD practices.

A CSSD practice is not only done using machine but needs staff; human factors should be considered. Some principles in human factors include simplifying the process, standardising the process, reducing dependence on memory, using forcing function, and working toward reliability.

To err is human and some will inevitably make errors. CSSD can review the systems and learn from errors. These errors can be addressed by providing feedback and encouraging productive conversation and critical analysis to prevent future errors. The no blame culture focuses on systems that led to the error rather than on the individual. Blaming personnel only creates anxiety and fear and does little to solve current problems or prevent them.

However, in a condition that shows purposeful disregard of the rules, zero tolerance culture is used. Leaders must not tolerate non-adherence. When best practices are known, these should be expected of all staff. If staff takes a short-cut in cleaning, disinfection or sterilisation process, these behaviours should be addressed and not ignored.

Challenges of CSSD

Complex instruments, for example air powered endoscopes, instruments with lumens or channels, are difficult to clean. When there is a failure in cleaning, the instrument cannot be sterilised or disinfected. While reprocessing complex instruments, always look for written instructions from device manufacturer and follow completely.

Written instruction from manufacturers known as Instructions for Use (IFU), include how to clean, disinfect or sterilise. Some reckless practice includes never reading the IFU and practicing only using sense or experience. CSSD should have this on paper, share with the whole team, and practice every step in reprocessing the instrument.

Immediate Use Steam Sterilization (IUSS), known before as flash sterilization, should be used only when there is insufficient time to process by the preferred method. IUSS should not be used as a substitute for insufficient instrument inventory. However, in many developing countries IUSS is often used.

Also, reusing Single Use Device (SUD) happens in developing countries. Reusing SUD usually has a high cost, high volume, and high demand criteria. Reusing SUD gives challenges in the cleaning process. Mostly SUD cannot be cleaned, there are a lot of channels or lumens. Healthcare facilities must have policies and procedure to reuse SUD and follow local guidelines. Tracking single use devices that can be used again should done correctly.

References available on request.

A CSSD practice is not only done using machine but needs staff; human factors should be considered.

Improved patient outcomes: Out with old, in with news!

By Dr. Diane C. Halstead, PhD, DABMM, FAAM, President and Director, Global Infectious Disease Consultants, LLC, Jacksonville Beach, U.S.

Laboratories are now playing an even greater role in addressing current challenges by using a value-based model and providing more timely results for improved patient care and treatment.

As a former Professor and Director of the Infectious Disease Diagnostic Laboratory service for two multi-system hospitals in the U.S., I have experienced an evolutionary change in laboratory medicine, specifically Infectious Disease Diagnostic Laboratories. Over the course of several years, we have been faced with numerous threats including new or re-emerging illnesses, antimicrobial resistance, healthcare-acquired infections (HAIs), more administrative requirements, staffing shortages, and decreased reimbursement. In addition to these challenges, there has been greater emphasis on decreasing hospital length of stay, improving quality of care, patient safety and experience, and supporting antimicrobial stewardship programs (ASPs).

TeamSTEPPS programme

In 1999, the Institute of Medicine (renamed National Academy of Medicine) published *To Err is Human*, a real eye opener, not only for the medical community, but also for the public. The article stated most adverse events (AEs) are preventable and caused by poor communication, yet they cause thousands of lives lost and billions of dollars spent. They concluded that AEs are due to process problems. This publication really began the patient safety and team training movement that led to the development of the evidenced-based TeamSTEPPS programme in 2005 by the Department of Defense (DoD) and Agency for Healthcare, Research and Quality (AHRQ), initially used by the U.S. military and now used internationally.

TeamSTEPPS is based on the use of a 3-phase programme (i.e., Assessment, Action Plan/Training/Implementation, and Sustainment), led by a multi-disciplinary change team (e.g., senior administrator who will have clout and resources to support and advocate for the programme, nurse/physician/lab leaders and other champions). They are responsible for mapping a process associated with AEs to identify when, where and who is involved, and then redesigning the process for a successful outcome.

A comprehensive tool-kit is provided that includes a multi-curricula of teaching materials based on the TeamSTEPPS framework, whereby change teams develop competencies in teachable-learnable skills (i.e., communication, leadership, situational awareness, and mutual support) and use communication tools to positively affect innate abilities of knowledge, attitudes, and performance. Some of the keys to a successful outcome include having an excellent team leader, team communication, and a shared mental model, i.e., all team members are on the same page. Although the TeamSTEPPS programme has commonly been used to correct problems related to direct patient care, it is amenable to being used successfully in other departments that affect patient care and quality, albeit indirectly.

Laboratory Utilization & Stewardship Team (LUST)

Laboratories are now playing an even greater role in addressing current challenges by using a value-based model and providing more timely results for improved patient care and treatment. Many laboratories have introduced automated equipment and molecular platforms for direct specimen plating and direct sample identification, respectively, MALDI-TOF for organism identification of an almost unlimited number of organisms, and next-generation sequencing of difficult to isolate or identify organisms.

Although an estimated 70 per cent of clinical decisions are based on laboratory results, close to 40 per cent of these tests are deemed unnecessary and are an over-utilisation of laboratory resources. Likewise, underutilisation of laboratory tests occurs leading to missed or delayed diagnosis, increased length of stay, and legal liability. To that point, some

healthcare facilities are developing a LUST to ensure the right tests are offered, ordered and performed. This is where multi-disciplinary teams are essential. Various models for developing a LUST exist based on resources and commitments of stakeholders. For example, a stewardship team supported by the C-suite, may include a pathologist, laboratory administrator and technical staff, a cross-section of physicians and nurses, information technology representative, and ad hoc members as needed. Toolbox strategies for improved laboratory utilisation are available, e.g., discontinuing obsolete tests, improving physician order entry design by test harmonisation, and using an evidence-based approach to establish practice guidelines.

Diagnostic Management Team (DMT)

In May 2017, the World Health Organization (WHO), recognising the importance of diagnosis prior to treatment, released the first essential in vitro diagnostics list of > 100 tests to be expanded annually, to guide countries regarding appropriate test selection. Some hospitals have even developed multi-disciplinary DMTs comprised of experts covering each of the laboratory disciplines to provide guidance to physicians in selecting the appropriate tests, avoiding over- and underutilisation of tests, and interpreting complex test results.

Clinical role of multi-disciplinary teams in sepsis

Kumar et al. reported a 7.6 per cent increase in mortality with each hour of delay in providing an effective antibiotic for septic patients. One of the milestone publications on sepsis, 3rd International Consensus Definition for Sepsis and Septic Shock (Sepsis-3) – 2016 guidelines advocate for patients with hypotension and a lactate > 2 mmol/L to receive antibiotics and fluid resuscitation along with blood cultures (BCs) and rapid molecular testing within 3 hrs (the so-called 3 h bundle). In 2018, an update was published calling for a 1 h bundle. These recommendations are challenging to adhere to, especially a 1 h bundle in a busy emergency department (ED) with high patient acuity. That said, they may be achievable using a multi-disciplinary TeamSTEPP approach for immediate assessment of qSOFA criteria (altered mental status, elevated heart rate, low systolic blood pressure) and point-of-care lactate for patients presenting with signs and symptoms of sepsis.

Laboratory role of multi-disciplinary teams in sepsis

BCs are still considered the gold standard for sepsis, even with less than optimal sensitivity and turnaround to results. Many laboratories have turned to using a molecular platform for pathogen identification to speed up results once a BC turns positive, e.g., Biofire film array, Nanosphere, ePlex BCID, or Accelerate that includes susceptibilities. In contrast, the T2Biosystems has the capability of identifying the most common Candida spp. and sepsis-causing bacteria directly from whole blood in ~3-6 hrs. Circumventing the need for a positive BC provides even more timely decisions for optimal antibiotic therapy or discontinuation of therapy, supporting the goal of ASPs.

We developed a multi-disciplinary committee (D.C. Halstead, unpublished data), e.g., pharmacy, infectious disease (ID) physician, and microbiology, with the goal of decreasing time to effective or optimal therapy in septic patients using a rapid molecular platform and immediate 24/7 communication of results to a pharmD. We appreciated a statistically significant decrease in time to appropriate and optimal therapy between the pre- and post- intervention period and attributed our success to the use of a multi-disciplinary team and improved use of communication skills.

The TeamSTEPPS approach can also have a significant impact on decreasing BC contamination rates to <3 per cent per guidelines. False-positive results can have severe consequences, e.g., overuse of antibiotics, resistance and AEs and increased costs. Meta-analysis has shown team strategies to be effective, e.g., saturation training using a shared mental model, collecting blood from venipunctures, not catheters, and using sterile gloves. The next guideline from the American Society for Microbiology (ASM) in collaboration with the Centers for Disease Control and Prevention (CDC), i.e., The Laboratory Medicine Best Practice initiative, will focus on updating their 2012 BC contamination guideline.

Summary

We will continue to see staff moving out of their safe silos into a multi-disciplinary workforce, greater reliance on developing basic skill competencies as advocated in the TeamSTEPPS programme for improved patient safety and quality of care, and implementation of Laboratory Stewardship and Diagnostic Management Teams for improved laboratory utilisation and test interpretations, respectively. Even though there have been many improvements in healthcare over the course of the last 10+ years, we need to be prepared for even more changes in 'culture' as we move into the third decade of the 21st century. Are you ready?

References available on request.

The TeamSTEPPS approach can also have a significant impact on decreasing BC contamination rates to <3 per cent per guidelines

Mass gatherings and infectious disease: Prevention is better than cure

By M. Lisandra Zepeda-Mendoza and Robin May, Institute of Microbiology & Infection, University of Birmingham, UK

The world has belatedly woken up to the threat of Zika virus, an outbreak that started in Brazil but rapidly spread throughout America, representing a world threat.

April 2015, Beijing Airport. "Finally, my turn!" I think, as I reach the passport control desk. But my Mexican passport is met with a frown, then several gestures and some rapid Mandarin that sees me routed off to the medical office. The world has belatedly woken up to the threat of Zika virus, an outbreak that started in Brazil but rapidly spread throughout America, representing a world threat. Every major airport deployed extensive security measures to try and prevent entry of the virus, a very visible reminder of the fact that pathogens do not respect borders. In a world where people travel all the time, coordinated efforts between countries are essential to tackle infectious diseases and simple, 'point-of-care' diagnostic tools are a key weapon in that fight. Within the Institute of Microbiology & Infection (IMI) at the University of Birmingham, UK, we are working with colleagues around the world to test new "hand-held" DNA sequencing instruments for the rapid identification of pathogens, allowing healthcare professionals to respond swiftly to emerging infections.

But how can an invisible organism such as a virus or bacteria cause global panic? First of all, although microscopic, these pathogenic agents are far from simple. Their genetic material is under incredibly dynamic control, integrating information from the environment in which the organism resides. Such mechanisms allow pathogens to develop new infectious strategies (e.g. colonising new hosts, or persisting within the environment), or acquire resistance to antimicrobial therapies.

In recent decades, this natural adaptability has been augmented by human irresponsibility, in particular in the prolific and often unnecessary use of antibiotics. The attraction of "trying" a safe wonder-drug antibiotic for an irritating cough frequently proves too alluring for many patients, but this comes at an often-unseen cost. Firstly, antibiotics do not kill viruses and the vast majority of coughs and colds are virally driven. Secondly, antibiotic treatments must be taken for the entire time prescribed by the doctor. Without this, the pathogenic bacteria that are being treated may not have sufficient exposure to the antibiotic, which can lead them to survive, multiply and potentially become resistant to that antibiotic. Lastly, antibiotics typically have a broad effect, meaning that they kill all the bacteria of a given class. This class includes the pathogen but may also include other beneficial bacteria that humans carry in their gut. Many of these 'inadvertent casualties' carry out extremely important functions that help our health – aiding digestion, gut health or uptake of nutrients. Consequently, unnecessary antibiotic use may not be as 'harmless' as widely thought.

Tackling this threat needs multiple strategies. Within the IMI we have groups developing new drugs to combat resistant infections such as tuberculosis or salmonellosis. In addition, we are also exploring unique strategies to try and 're-use' existing drugs for which resistance has already emerged, by blocking the mechanisms that bacteria use to

become resistant in the first place.

Once evolved, antibiotic-resistant or virulent pathogens are not a major health concern if they don't spread. However, as anyone who has travelled on rush hour public transport can attest, it is only too easy for such microbes to spread. Trains, buses and planes are full of people coughing ("Is it pneumonia…?"), sneezing ("…flu..?") and wiping sticky hands on seats and handles ("…or something worse?").

One of the most recent projects carried out in the IMI at the University of Birmingham has been aimed at characterising the microbial load in the carriage air from a train line that runs from London to Edinburgh in the UK. This is done by extracting the DNA of the microbes trapped in the filters of the train's air conditioning system. The DNA is then processed to determine the presence and distribution of pathogens across the rail network, thus unveiling the implications such microbiome could have on the commuters. Using this information, the aim is to ultimately design improved infection prevention methods. As the saying goes, "prevention is better than cure".

Mass gatherings

The challenges of pathogen spread are massively augmented when large numbers of people come together at mass gatherings such as religious celebrations, major festivals or even social gatherings such as football matches. Such events bring people from all over the world into close proximity, often sharing accommodation, food and sanitary facilities. Consequently, a novel virus from Sweden or an antibiotic-resistant bacterium from Chile can find themselves in Australia or Canada within days. The extraordinary growth of international travel means that new, faster and more accurate diagnostic tools – particularly those that harness the power of DNA analysis to identify pathogens precisely without relying on clinical symptoms – will be essential if we are to tackle these new risks before they threaten global populations.

Finally, a growing threat comes from so-called 'nosocomial' pathogens – infections that are acquired whilst in hospital or other healthcare settings. Hospitals represent a particular infectious challenge; antibiotics are being used all the time, staff go from room to room and across halls visiting their different patients and there are roomfuls of sick, undiagnosed people in waiting rooms. Hospitals, therefore, represent a particular environment that selects for pathogens that are resistant to antibiotics and that are more virulent compared to those pathogens out in the community. Thus, hospitals require special infectious risk management.

Klebsiella pneumoniae is one such example. This bacterium is a major cause of antibiotic resistant nosocomial infections, with mortality rates >50 per cent. In 2011, there was a K. pneumoniae outbreak in a hospital in the U.S., where one of the transmission events was from a ventilator that had been used for a single patient with K. penumoniae. This ventilator had been thoroughly cleaned after usage. However, the high degree of environmental stability of K. penumoniae allowed it to survive and infect a new host.

Without rapid and diverse new therapies, humanity faces the prospect of a bleak future without routine antibiotic treatments and where emerging pathogens can sweep around the world unimpeded within days. However, by working in close international collaboration and taking multiple, innovative approaches to treatment and prevention strategies, we may yet avoid a return to the "Dark Ages" of infectious disease.

The challenges of pathogen spread are massively augmented when large numbers of people come together at mass gatherings such as religious celebrations, major festivals or even social gatherings such as football matches.

The vital role of technology in improving patient safety

By Wayne Miller, Healthcare Director EMEA, Zebra Technologies

Medical errors are reported to be the third-leading cause of death after heart disease and cancer.

Meeting the global demand for healthcare services presents clinicians and medical staff with a range of challenges, from securing patient data, supporting aging populations, short staffing, meeting strict targets and, unfortunately, dealing with problems when things go wrong. Patient safety is a serious global public concern. Estimates show that in high income countries, as many as one in 10 patients is harmed in some way while receiving hospital care, with nearly 50 per cent of accidents being preventable. Globally, the annual cost of medication errors has been estimated at €42 billion.

Medical errors are reported to be the third-leading cause of death after heart disease and cancer. A recent Johns Hopkins study claims that more than 250,000 deaths in the U.S. every year occur through medical errors. The World Health Organization (WHO) estimates that strategies to reduce the rate of adverse events in the European Union could help prevent more than 750,000 harm-inflicting medical errors every year, leading to over 3.2 million fewer days of hospitalisation, 260,000 fewer incidents of permanent disability, and 95,000 fewer deaths per year. As a result, it's no surprise that calls for safer health systems and high-quality legislation on patient safety are growing.

Technology has a role to play. The right application of technology can enhance clinician communication, improve medication safety, reduce potential medical errors and improve the overall patient experience.

At the heart of this digital transformation of healthcare is the use of printing technology and mobile computers to help reduce human errors and ensure data is used to its maximum benefit, and cost effectively – thanks partly to the barcode.

Reducing human errors

One of the major causes of errors in medical care is poor quality information capture. Today, European hospitals still record essential patient data in hand-written form, increasing the risk of the wrong medicine being administered to the patient. To improve this situation, scanning and printing technologies should be used to collect and print patient information accurately and swiftly, to identify and help protect the patient.

When a patient is first admitted into a hospital, details such as date of birth, case history and allergies must be captured accurately, or it can lead to problems. The ability to obtain patient information instantly is vital and any delay caused by lost documents, smudged lettering or misspelling could prove fatal. We know that around 10 per cent of blood bags are incorrectly administered due to human error. In the case of blood transfusions, using an auto ID solution with barcode tracking from printers and mobile computers could reduce the error rate to less than 1 per cent. If patient information is accurately recorded by scanners, printers and mobile computers, there is less chance of the wrong blood type being administered to the patient.

Fatigue is a very common reason for human error and technology could help eliminate this. When mobile computing is used, information on a printed drug label can be linked back to a system that will check clinical decisions against patient medical history, at the touch of a button. In this case, technology will help enhance the safety of patients and the reputation of a medical organisation.

Using data

Better use of data capture and analysis means a better healthcare system for the future. One way to improve healthcare provision is to look at potential mistakes in patient care and to carve out a 'lessons learned' manual. 'Near misses' refer to errors in medical practice that almost happened (such as the incorrect administration of medicines) and learning from these incidents can help drive effective staff training, improving patient safety.

Today, technology can drive efficiency, safety, productivity and visibility across global healthcare. There is clear evidence that technology can save money, reduce errors and help reduce litigation culture.

Barcoding healthcare

Invented in 1952 and inspired by Morse code, the barcode is enhancing processes in hospitals and the pharmaceutical sector, where there is still a reliance on handwritten documents, leading to potential errors. Instead of manually documenting treatment, barcodes and scanners can be implemented along with a patient identity management solution to accurately and quickly match patients to their records, medication and treatments. This ensures mistakes are kept to a minimum, while patients receive the right care.

The benefits can also be seen across an entire healthcare facility, ensuring care teams can communicate and work together to assist multiple patients, by adopting healthcare mobility solutions. These solutions enable hospital staff to reliably communicate with each other and quickly and securely provide critical medical information. Patient data can also be collected and shared in real-time, providing access to patient vitals, diagnoses, imaging and much more. This all leads to workflow efficiency improvements and a reduction in false alarms, notifications and most importantly, fatalities.

The barcode is even being used to monitor the health of the institution itself. From physical assets like an MRI machine to the staff, it can help enhance real-time data sharing and analytics, making the facility even more efficient and effective – and safer.

References available on request.

The benefits can also be seen across an entire healthcare facility, ensuring care teams can communicate and work together to assist multiple patients, by adopting healthcare mobility solutions.

New horizons for medical waste treatment technology

By Krishna Gautam, CSIR-Indian Institute of Toxicology Research, India; Monish Bhandari, Maser Technology, India; and Nashat Nafouri, Quality Logic, Kingdom of Saudi Arabia

The proper management of hospital/healthcare/biomedical waste has become topic of enormous concern having global implications and attention. Healthcare facilities such as hospitals, physician clinics, dental facilities, laboratories, medical research facilities, veterinary clinics, etc., produce 10 to 15 per cent infectious waste of total general waste according to World Health Organization (WHO). The waste generated in such facilities is termed as biomedical waste. The mushrooming of the healthcare industry within the milieu of the developing countries coinciding with the drift towards greater environmental consciousness, and greater accountability of both the occupier and the common bio medical waste treatment facility operator, bring the concept of reducing, recycling and reusing to the fore.

A study by Marinkovic et al. (2007) indicated that the hazardous medical waste including infectious waste, sharps, pathological waste, chemical waste, pharmacological waste and cytostatics corresponded to 14 per cent of the waste generated from healthcare services in Croatia. Similarly, the amount of infectious waste was determined as 15 to 20 per cent of healthcare waste, and in the U.S. this rate was around 15 per cent according to Lee and Hufman (1996). In a case study it was found that the major producers of hazardous waste are state hospitals with a generation rate of 57.9 per cent.

As of now the untreated infectious waste is directly sent to common bio medical waste treatment facility for incineration or final disposal. Thereby, the chance of infection during transportation, interim storage and handling is greater.

Therefore, due importance must be given to disinfection or sterilisation of infectious laboratory and bio-hazardous wastes at the point of generation, to find a better solution or appropriate technology for the proper management.

However, various technologies are available in the market at a global level, in which the most commonly used technology for biomedical waste management are incineration, chemical disinfection, steam sterilisation, land disposal and inertisation. Recently, microwave technological leaps have opened new horizons for medical waste treatment and are promising an opportunity that has less burden on the environment, shorter time of treatment and are more cost effective. The aim of this study is to explore the efficacy and benefits of microwave technology in comparison to the existing available methods of bio-hazardous wastes treatment.

Comparison of microwave to other waste treatment technologies

Among all the technologies, steam autoclave is a broadly used technology as an alternative to conventional incinerators. However, steam-based sterilisation has several limitations such as slow heating, penetration depth, pre-and post-treatment process, size and load limitations. Concerning operating costs, the compendium noted for autoclaves between US$0.14 and US$0.33 per kg, and for batch microwaves about US$0.13 per kg, respectively (UNEP, 2012). Other limitations of steam sterilisations like some plastic ware melts in the high heat, and sharp instruments often become dull. Moreover, many chemicals breakdown during the sterilisation process and oily substances cannot be treated because they do not mix with water. Previously it was reported that the anatomical and pathological wastes, low-level radioactive waste, organic solvents, laboratory chemicals, and chemotherapy waste should not be treated in an autoclave.

From the above mentioned four methods (i.e. thermal, chemical, irradiative and biological), the irradiation is very effective as well as rapid. The irradiation-based technologies involve ultraviolet, gamma, electron beam as well as the microwave. However, radiation sterilisation techniques do have a number of drawbacks. Capital costs are high and specialised facilities are often needed. Gamma radiation requires a nuclear reactor; E-beam/X-ray radiation is generated using electron beam accelerators. Common plastics such as polyvinyl chloride (PVC), acetyl and polytetrafluoroethylene (PTFE) are sensitive to gamma radiation, thereby limiting the use of Gamma. The high energies involved in e-beam radiation can also lead to main chain scission (breaking of the long chain backbone) and chemical cross linking of packaging polymers.

But in case of microwave irradiation such types of limitations are overruled. This technology is based on the low heat thermal process where disinfection occurs through action of dielectric heating. In this process, the changing electric field forces the molecular dipoles (such as water) to be aligned according to field, which creates rapid heat due to molecular friction. However, back and forth movement of ionic molecules in the oscillating electric field is another reason for instant heat generation and subsequent annihilation of virus, fungus, yeast, bacteria and spores. In a study, the efficacy of a batch microwave was evaluated by Dhole and his team at Sanjay Gandhi Postgraduate Institute of Medical Sciences against the NPEB/ Polio-1 virus of NIBSC strain and for quantitative analysis and the viral load was determined via 50 per cent tissue culture infective dose (TCID-50), and it was found that the value of TCID-50 is zero, which means no contaminants were found after 360 seconds of microwave exposure at 100 degree C and there is no cytopathic effect (CPE), as was observed (Qualitative Analysis).

Comparison of microwave to autoclave

In conventional or surface-heating systems, such as those found in autoclaves, a composite part heats from the outside inwards: as heat energy is transferred through the part's thickness. The process duration is determined by the rate of heat flow into the composite structure. The flow rate depends on the material's specific heat, thermal conductivity, density and viscosity. As a result, the edges and corners of the part achieve the set point temperature before the centre does. The subject part also heats at an uneven rate, which can stress the finished product. Therefore, the temperature in an autoclave and a conventional oven must be ramped up and down slowly to minimise part stress, a factor that makes overall sterilisation difficult and awkward.

Conversely, microwave technology relies on volumetric heating. Heat energy is transferred electromagnetically and relatively evenly and quickly throughout the part and therefore, not as a thermal heat flux. This enables better process temperature control and less overall energy use and thereby resulting in shorter cure cycles. It also enables the processor to direct heat specifically toward the part to be cured, thus maximising the curing process efficiency. Surprisingly, all this sterilisation is archived more effectively with very high sterilisation quotient. In various studies conducted at the Centre for Innovation and Translational Research (CITAR), CSIR-Indian Institute of Toxicology Research, the disinfection efficacy of a portable batch microwave system was assessed against both gram-negative and gram-positive bacteria and yeast on different types of materials used in hospitals and laboratories such as linen cloth and fabrics, rice husk, corn cob (animal bedding material) and blood culture bottles and from these studies it was concluded that the log reduction efficacy of microwave is much greater than autoclave. In case of contaminated linen, the efficacy of microwave is up to 8 log reduction, within 10-minute exposure of 2.45 GHz (Gigahertz) at 70 °C. Similarly, a 10-log reduction was achieved after the 30-minute exposure of microwave irradiation at 100 degree C for rice husk

In conventional or surface-heating systems, such as those found in autoclaves, a composite part heats from the outside inwards: as heat energy is transferred through the part's thickness.

Nashat Nafouri

▼**Table 1.** A comparative analysis of Microwave with Autoclave

#	Parameters	Microwave-assisted Thermal Sterilization (MATS)	Autoclave
1	**Basic technology**	An innovative, mobile, easy to use, environment friendly revolutionary technology that uses microwave to sterilise	Steam based archived (100-year-old) technology that not only consumes too much of space, time and energy but is also highly dangerous because of steam, pressure etc.
2	**Mobility (onsite sterilisation)**	✓	✓*
3	**No skilled labour required**	✓	x*
4	**No metal corrosion/ contamination**	✓	x
5	**Plastic fibres treatment**	✓	x
6	**Non-charring of sugar and carbohydrates present in samples**	✓	x
7	**Proper serum and cell culture media sterilisation**	✓	x
8	**Internet hub connectivity**	✓	✓*
9	**Sterilisation process time**	30-45 min	120 min
10	**Consumables, maintenance and recurring cost**	Nil	Pressure sensitive tapes, bags, release solvents
11	**Energy required**	3 Kw/hr, 16 Amp, 1Ø	20 Kw/hr, 25 Amp, 3Ø

** Only on high end equipment*

The power consumption, water consumption and cost per kilogram of waste treatment through microwave technology make it an eco-friendly and cost-effective system.

and corncob but in case of blood culture bottles the same temperature is sufficient for 10-minutes to inactivate any type of bacteria, fungi, yeast and spores. Inevitably, microwave-based sterilisation is much under 100 Celsius and thereby allowing heat sensitive materials an easy pathway with minimum application of resources.

The following table-1 summaries the comparison outcome between the autoclave and microwave from many different aspects, which any healthcare facility may take into consideration when planning for effective on-site bio-hazardous waste management:

The steam autoclave is the closest market competitor for Microwave (MATS) but the comparison of the technology platform, infrastructure requirement, environmental impact and operational cost would make Microwave of more favourable choice over steam autoclave. As shown in Figure 1, the power consumption, water consumption and cost per kilogram of waste treatment through microwave technology make it an eco-friendly and cost-effective system.

Microwave technologies are available at a global level, which negates all kinds of limitations and challenges usually for disinfection and/ or sterilisation of infectious medical waste at the point of generation. Usually, in small and medium size hospitals, it is difficult to follow all the steps and guidelines for medical waste management. However, such hospitals manage the wastes through agencies or vendors to transport at incinerators. Therefore, an on-site solution for medical waste treatment with real-time monitoring is needed, to avoid any kind of security breach during interim storage in the facility and transportation of medical waste from the hospital to treatment site.

The WHO has also recommended "microwaving" as one of the alternative non-burn methods for biomedical waste management. Thus, proper segregation of hazardous and non-hazardous waste and treatment of non-hazardous waste through microwave-based disinfection/ sterilisation system will help in the following ways:

1. Drastically reducing the amount of waste going for incineration and thus decreasing the institutions/user carbon footprint as pollution caused by incineration is reduced.
2. Concerning scarce natural resources with almost zero utilisation of water and electric energy.
3. Very high level of microwave sterilisation archived in 1/4th the time reduces infection load and safe disposal.
4. Low cost of installation and maintenance.

Exciting outcomes from various studies using microwave (MATS)

In further studies at CITAR, a microwave unit was shown to provide multiple logarithm reductions in

both vegetative bacterial cell counts, and bacterial spore counts in laboratory-inoculated samples. From this study a 10-log disinfection efficacy of representative bacteria and fungi (in liquid cultures) was achieved via microwave (2.45 GHz) treatment at 70 degree C with a hold time of 20 min. A 6-log disinfection efficacy of representative heat resistant Bacillus subtilis spores was also achieved at 100 degree C with a hold time of 30 minutes.

On the other hand, the effective disintegration of gram-negative cell walls in municipal secondary sludge by microwave was confirmed by scanning electron microscopy and it was suggested that this technology could be an effective pre-treatment method for sludge that is dominated by gram-negative microorganisms. It was already said that due to exposure to the microwave, E. Coli and B. subtilis was entirely due to thermal energy.

For healthcare waste, scientists at the National Institute of Standards have devised a way to sterilise medical instruments and waste for hospitals in a device similar to a conventional microwave oven and termed this the "sterilisation wave of the future". In 2007, an experiment was designed to simulate a poultry mass mortality event and generated a 7-log reduction in the microbial load of Salmonella enterica and a 5-log reduction in Bacillus atrophaeus spores. Therefore, the literature review and ongoing researches show clear evidence base that the use of microwave for the management of biomedical waste is a promising concept.

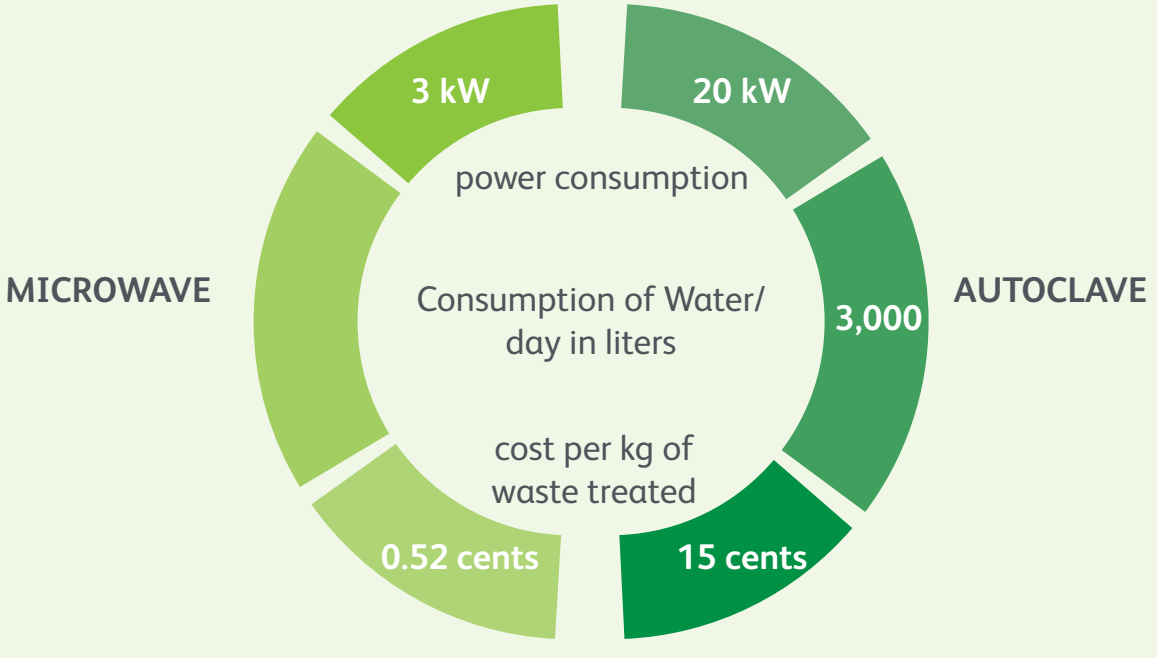
Conclusion

Ongoing research and applications of microwave technologies (MATS) have shown and proven that microwave devices are an effective tool for the inertia of biohazard waste to control the spreading of highly pathogenic microbes present in waste during the interim storage in healthcare facilities and transportation when the infectious waste is treated at the point of generation. When compared to other technologies especially autoclave, microwave MATS is likely to have similar sterilisation efficacy if not better in protecting the integrity of heat sensitive materials, has shorter processing time, and takes advantage of microwave-assisted processes requiring control of water content. In addition, it saves energy, cost and thus leads to a low carbon footprint. In our opinion, for those healthcare facilities seeking operational excellence and sustainable resources in line with the untied nation (UN) goals and WHO initiatives in reducing infections worldwide, global warming and energy/water consumption, microwave technologies provide promising clean solutions and are becoming the leading cutting-edge solution for the biomedical waste management industry thanks to its supportive applications.

References available on request.

Scientists at the National Institute of Standards have devised a way to sterilise medical instruments and waste for hospitals in a device similar to a conventional microwave oven and termed this the "sterilisation wave of the future".

▼**Figure 1.** Cost and Power consumption comparison between autoclave and microwave technology



Best practices for water safety in healthcare facilities

By Deepa Narwani, Editor

Franco Ferrari, Engineering and Operations Director, Culligan Middle East

When a patient visits a hospital, there are a number of questions running through their mind. The most common ones include what will the diagnosis be, and will I be taken care of? But they won't be stressing about water safety, as it is taken for granted that the building is a sanatorium of sanitation. But think about it. Water is used throughout a hospital for everything right from steam generation, heating/cooling, sterilisation of surgical instruments, dialysis treatment, among others. So, how then do hospitals ensure that the water running through their veins is of the highest standard?

Arab Health Magazine had a chat with Franco Ferrari, Engineering and Operations Director, Culligan Middle East, to find out what happens behind the scenes when it comes to water safety in hospitals. A renowned water treatment company, Culligan provides water solutions for hospitals across the region, complying with the strictest medical and healthcare standards.

Ferrari, who is celebrating his 40th year with the company, shared: "In the early 1970s, Culligan started working with hospitals in specific sectors. A hospital needs water for all its services and utilities, right from toilets, to drinking water, but they also have certain specific divisions for which they need water. This includes laboratories, dialysis, and also the technical part such as the boiler or cooling tower. We cover all these requirements, starting from the water treatment of the building, to disinfection, filtration, and softening. The water needs to be treated to ensure that when it is distributed in the hospital to the many different toilets, labs or patient rooms, it is pure, organic and sanitised."

In the laboratory, the treated water i used for washing equipment, and for disinfecting tools that will be used for surgeries. It is also used for steam sterilisation of equipment.

He explained that, for instance, some hospitals have the facility of a rehabilitation pool, and these need to be treated with quality water, otherwise it could produce bacteria such as Legionella, causing diseases. "This is a cause of concern as the people in the hospital are quite sick, so they are weak, and Legionella can attack them very easily and we have to prevent it from growing into the water."

Safe and reliable

Recently, when a hospital in the UAE needed to update its haemodialysis water treatment equipment and process, Culligan designed a water filtration system to provide the right quality of water for the haemodialysis loop, in the process bringing a reduced need for desensitisation and lower chemicals impacts, along with significant time and cost savings. The company also updated the material of the pipe of the distribution, in order to make it suitable for disinfection with hot water or steam.

Ferrari emphasised that the focus should not only be on the water treatment itself but also on the way the water is distributed in order to avoid having any stagnant water in the pipeline. "We design these elements carefully so that there is no contamination growing into the pipeline. Also, the pipeline needs to be sterilised periodically. We use hot water, at 80 to 85 degrees, to clean the equipment and pipes, and to remove and kill most of the bacteria. We were one of the first companies to apply reverse osmosis in dialysis," he added.

Another factor for consideration is ensuring that there is no stop in the flow of the water. For example, if a patient has started the process of dialysis, it can't just stop in between for four hours. Ferrari highlighted that therefore all the equipment should be carefully controlled and verified.

He stressed: "We have a system controlled by PLC, a computerised system that calculates the quality of water, in order to avoid wasting unnecessary water and be more sustainable. We also have online test equipment that measures the chlorine content and our technicians have test kits to do a field test analysis. The quality produced by the equipment has to meet international standards. Emphasis also has to be given on the material used and how you can disinfect and maintain the equipment."

Ferrari concluded: "In my previous work experience, I used to be involved in commissioning of water treatment plants across Europe, Africa and the Gulf. There is no more satisfaction than to give good water to people. The first thing I used to do was to drink a glass of water in front of them, to assure them that the water was good. And when it comes to hospitals, nothing gives more satisfaction than producing something that can benefit humanity."

UVC disinfection method in hospital environment

Mediland Hyper Light - A chemical-free method for HAI

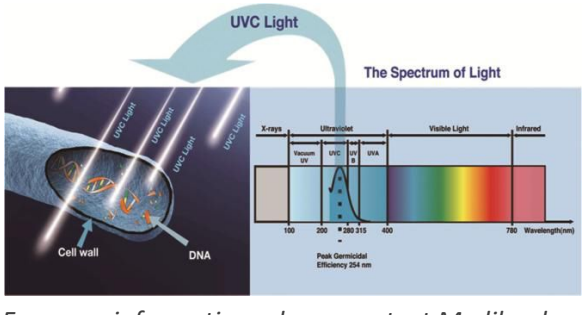
Healthcare-associated infections caused by multidrugresistant pathogens are significantly associated with increased mortality, morbidity and excessive healthcare costs. Thorough cleaning of hospital environment is crucial in limiting transmission of pathogens and reducing healthcare-associated infections (HAI). However, up to one half of room surfaces were found to be inappropriately cleaned by traditional manual methods of disinfection using various assessment tools (e.g., visual observation, adenosine triphosphate bioluminescence, aerobic colony counts). Therefore, in addition to traditional interventions, some novel, no touch methods are warranted to improve terminal room disinfection.

Clinical trial for outstanding effectiveness in killing bacteria, mycobacterium and fungi, journal on ScienceDirect

Clinical trial conducted by National Taiwan University Hospital in Taiwan in three uncleaned rooms previously admitted by patients harboring MRSA, VRE and other nosocomial pathogens with at least a 7-day hospitalization. Placed Hyper light 5 min at 3 sites (total 15 min) and inspect the before-after effect by the samples collected from 7 high touch spots in the 3 rooms separately. Report shows a significant reduction in the median number of total bacteria colony counts after UV-C irradiation of 15 min was demonstrated after 24 h incubation (35 CFUs vs 0 CFUs, p = 0.0005) and 48 h incubation (165 CFUs vs. 0 CFUs, p < 0.0001) of the samples respectively. (ref. Table3)

Efficient and non-toxic practice for both medical staff and patients

We all know that hospital wards, operating rooms are both critical for the environment hygiene. Therefore, by utilizing ultraviolet-C (UV-C) radiation with wavelengths 254nm for 15 minutes in a general size of operating theater or wards(around 55.74 m²), Hyper light can efficiently shorten the preparation, working time of disinfection procedure, moreover, without any waiting period for volatilization after disinfecting. Applying to solely 254nm of the UVC spectrum makes Hyper light an ozone-free, chemical-free and eco-friendly disinfection system, providing no risk for asthma patients and medical staff, and can immediately enter the space after disinfection procedure.



For more information, please contact Mediland
https://www.mediland.com.tw/mediland/index.aspx

Table 3 Analytical data and comparison of bacteria colony counts on different surfaces in 3 patients' rooms before and after UV-C irradiation with incubation for 24 and 48 h.

UV-C irradiation	Incubation time (hours)	No. of samples	Median CFU (IQR)	Min	Max	P value
Before UV-C	24	20	35 (2.5–135)	0	1700	0.0005
After UV-C	24	20	0 (0)	0	90	
Before UV-C	48	20	165 (72.5–302.5)	0	4370	<0.0001
After UV-C	48	20	0 (0–27.5)	0	550	

No.: number; CFU: colony-forming units; IQR: interquartile range; Min: minimum; Max: maximum.

Achieving Infection Control Best Practices in Blood Banks and Laboratories

ITL BioMedical

ITL BioMedical: Enabling clinical safety and efficiency

ITL BioMedical is a leading provider of medical devices and systems that enhance the safety and efficiency of biological sampling and clinical procedures.

ITL develops innovative products for the clinical, blood banking and laboratory markets, and specializes in products for the laboratory blood culture testing market.

With a focus on safety and efficiency, ITL BioMedical is transforming the blood culture testing market through advanced products and systems for safer sample collection and transfer.

The company seeks out user feedback to optimize end-user safety and efficiency, and effectively meet stringent clinical demands and regulatory requirements worldwide.

Its products are held to the highest quality and regulatory standards in the industry and are trusted by healthcare professionals around the world.

ITL BioMedical products are used to achieve best practice in infection control in blood banks and labs around the world.

The importance of infection control in healthcare

Safety and efficiency in sample management are at the forefront of ITL BioMedical's mission to protect the lives of patients and healthcare workers through excellence in infection control and prevention.

Each year around 1 in 10 healthcare workers – from laboratory and blood banking staff to nurses and physicians – are affected by needlestick or sharps injuries worldwide. The underreporting of sharp injuries by employees has also been documented, with studies showing that the rate can be anywhere from 22% to 99%.

Dozens of blood-borne pathogens can be transmitted from needlestick injuries including hepatitis B, hepatitis C, and human immunodeficiency virus (HIV). These types of injuries can have a significant financial impact on the healthcare industry and a major psychological impact on the workers involved.

The two most common causes of needlestick injury in the workplace are two-handed recapping and the unsafe collection and disposal of sharps waste. Transferring blood between containers can also be a hazardous practice for needlesticks.

The need to utilize products that promote best practices and processes in blood banks and labs has never been more important.

The new standard for safety in blood culture sampling

SampLok Sampling Kit 10mL | SampLok Sampling Kit 16mL | SampLok Sampling Kit 35mL

SampLok® Sampling Kits:

Platelet transfer kit for bacterial detection testing

A blood banking industry standard for over 15 years, SampLok Sampling Kits offer a simpler way to collect and transfer biological samples for testing.

- Efficient design reduces the number of procedure steps
- Integrated safety lid provides needlestick protection
- Three volume options – 10mL, 16mL and 35mL*
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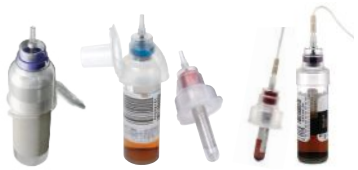
*Available late 2019



SampLok Adapter Cap | SampLok Adapter Cap 2 | SampLok Adapter Cap 3

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Safety Subculture Unit | Safety SubcultureUnit 2

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- Fits a variety of culture bottles

Transfer Cap Set

Transfer Cap Set:

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Minimise potential blood culture exposure with the Transfer Cap Set.

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- Plastic safety tip that's easy to insert and remove from culture bottles
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Huawei's Telemedicine Solution offers medical care anytime, anywhere

Article provided by Huawei

King Salman Armed Forces Hospital (KSAFH) is the largest hospital within the North Western Region of the Kingdom. KSAFH aspires to become a reference model for medical services delivery in the Kingdom. The hospital already provides a number of specialties with the highest levels of healthcare and safe medical practice.

North Western Region is home to almost a million residents who are at least 1,800km away to the closest metropolitan area, which has access to most of the healthcare specialist facilities. In addition, attracting qualified healthcare staff to the region is a major challenge resulting in higher operational costs as well as un-even distributed healthcare resource allocations across KSAFH medical specialties.

Majority of the resident population has limited access to specialized healthcare facilities, with the nearest well-equipped hospital approximately 1.5-hour flight time.

Regional remoteness impacts clinical staff to meet Continuous Medical Education (CME) credits resulting in more days off to meet travel time requirements. Further, due to lack of adequate network connectivity multi-disciplinary medical consultation meetings had to be conducted face-to-face.

To address the challenges, KSAFH selected Huawei to implement its Telemedicine Solution. The Telemedicine solution was developed to extend the reach of quality healthcare to remote locations for providing remote expert consultation, remote medical education, remote monitoring and patient referral management. The Telemedicine Solution has the capability to offer medical care anytime, anywhere with the same level of interaction across multiple parties as if they are present in close proximity to each other.

During Phase 1, a key feature implemented was "Remote Expert Consultation". The Solution connects doctors and patients across different cities providing a user near real-life face-to-face consultation experience through HD audio and video, just as if they were in the same room.

Patients and doctors at KSAFH are enabled to share medical information and patient symptoms with specialist doctors in real time to provide medical advice and treatment guidance. With this, patients got the opportunity to share their health issues with remotely located specialized doctors and obtain prompt medical consultation. In addition, local doctors where able to consult with their specialty trained physicians as and when required for safe medical practice. Further, for specialized

cases where patients needed to be transferred to other hospitals and experience long wait times for scheduling appointment with specialist doctors, became a thing of the past. Remote Expert Consultation, therefore eliminated wait-times improving quality of care for the residents of North West region.

The Solution is also equipped with a fully enabled mobile cart to facilitate "Mobile Ward Rounds". Telemedicine Mobile Carts allow medical consultation remotely without the need to shift the patients into the Telemedicine Consultation Room. And the cart is enabled with UPS system that makes it a fit device for critical medical usage and the device integrates with doctor's workstation to provide a seamless user experience. The uses of telemedicine Mobile Cart extend far beyond the Mobile Ward Round since the cart is equipped with two monitors, one dedicated for video-conferencing, second for displaying medical data that includes:

- Remote Monitoring
- Home Care
- Long Term Care
- Medical Training
- Remote Communication

For Phase 2, KSAFH and Huawei have planned the construction of a new facility to enhance the utilization of Telemedicine Solution. The new facility will have a diagnostic room specifically designed for multiple physicians to provide second opinion on-demand. Further, the new facility would enhance medical training with the rollout of new multimedia classrooms for online lectures and remote seminars. HD audiovisual recording capabilities of the solution will also provide archival and playback on-demand for the hospital. The solution provides the scalability to integrate across multiple remote virtual primary care clinics to enhance healthcare access to PHCs across the Kingdom.

The Telemedicine Solution is a major milestone to change the model of care for the residents of North West region to enhance the quality of care, provide improved healthcare access and continuity of care.

"We owe a major responsibility to the citizens in the region. In a remote area within a large country, quality healthcare accessibility is a big challenge, and we embarked on a journey to fix just that. We personally witnessed a live demonstration of the telemedicine solution and we knew this is what we needed. Huawei understood our needs and aims thoroughly, and our experience with them has proved that we have made the ideal choice of partner. The solution has sparked a healthcare revolution in North West region, and we look forward to achieve upcoming phases of our journey,"

said Major. Abdulrahman Alodhayb, CIO KSAFH, *Alodhayb@nwafh.med.sa*

The solution was introduced in a total of six medical centers across the region including:

- Air Defense Medical Center
- Al Salama Family Medical Center
- Al Razi Family Medicine Center
- Main Airbase Medicine Center
- Women Health Center
- Armour Medicine Center

Overall, the clinics have experienced a 30 per cent increase in percentage of cases resolved remotely as a result of the telemedicine solution. In the span of three months, nearly 3,000 patients benefited from the telemedicine solution. KSAFH has set a benchmark for utilizing technology for transforming healthcare service delivery. The expert consultation request, which once used to take days can now be provided on-demand as and when required.

A whole new STERI WORLD

Article provided by STERI WORLD

Wayne Spencer, Editor of STERI WORLD

If you are working in sterile supply or infection control, you'll probably be aware of the international journal Zentralsterilization/Central Service. Central Service has been in publication for over 25 years and is well-established in the field. It was the first sterilization journal to be published simultaneously in two languages and remains the official journal of the German Society of Sterile Supply – DGSV. However, when it was first published in 1992, few people had heard of the Internet and print-based media was the dominant form.

But today, things have changed. Sixty three percent of the world's population now owns a mobile phone and the vast majority of these are smartphones capable of displaying complex media in addition to text-based content. This opens up new ways of presenting technical information and sharing experiences. With these new opportunities, the time seems right to launch a digital journal that complements Central Service, and which can easily be distributed and viewed electronically.

The first ever edition of STERI WORLD from mhp was published in February 2018. STERI WORLD is designed to be read on a smartphone or tablet as well as on the computer. The articles are a mix of some shared content from Central Service and original content that may be difficult to experience in a printed journal. In time, STERI WORLD will also contain video articles and other media.

Expert help with everyday decisions

New devices, ever more complex devices and processes, less time – there is no doubt that sterile processing technicians and managers are facing more challenges and will have to pose new questions every day of their working lives. These include:

- How do you deal with new, unknown devices?
- Do you sterilize your bronchoscopes? And if you don't – should you?
- How can you find out what's left in your scopes after cleaning?
- How do you do risk assessment? Do you know the definition of risk contained in EN ISO 13485 and how it compares to the one in EN ISO 9001? How does this influence the audit process?
- How do you check your cleaning results?
- What is parametric release?

"Finding the answers to all these questions requires subject knowledge, and this is where peer reviewed journals such as STERI WORLD and Central Service can contribute," says Wayne Spencer, co-editor of Central Service and Editor-in-Chief of STERI WORLD. "That's why I am pleased to support the launch of STERI WORLD, with the STERI WORLD Newsletter as the main feature appearing every month in an inbox near you!"

Newsletter alerts you to new content

Our email newsletter will announce the arrival of new articles. Expert advice that's tried and tested and easily accessible anywhere. You fight for patient safety – we help you to do it right!

For special topics, there is also the opportunity to purchase a compilation for a small cost. All of this can be done seamlessly through your electronic devices. Sign up at steri-world.com/newsletter now to be up to date at all times!

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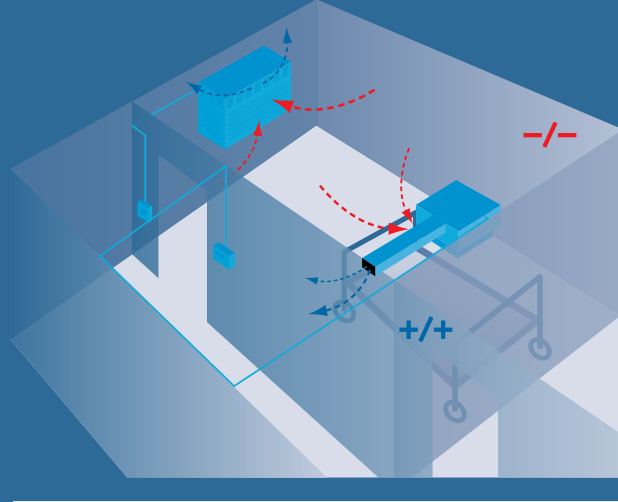
MedicCleanAir® technology instantly reduces the infection rates in your hospital
20 years of clinically proven track record with highly ranked University hospitals and with governmental specialists in infection control and epidemiology resulted in very efficient devices.
15 highly cited publications from Belgium, Germany, UK, France, Italy, India, … on the effectiveness of MedicCleanAir® technology proving that MedicCleanAir® is able to reduce the number of infected patients to ZERO. In other words: when you install MedicCleanAir® devices in high care areas, the number of airborne infections can be reduced to ZERO. No more discussions about air quality in my department!



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Installation time and results: 1 day max. No more discussions about air quality in my department!

No loss of investment
MedicCleanAir® devices are mobile or semi-mobile. When MedicCleanAir® devices are implemented in certain rooms or departments, and the hospital decides 5 years later that the rooms need to be used for something else, the MedicCleanAir® machines can be dismantled, cleaned and be installed in another place. In other words the investment is never lost: A huge advantage!

References
Belgium, Germany, Switzerland, UK, France, Austria, Italy, Spain, but also Saudi Arabia, Kuwait, UAE, Lebanon, Egypt, Philippines, South Korea, and many others.
Main reference: MedicCleanAir® has installed the air purification devices and isolation units for isolation rooms in more than 300 hospitals in the Kingdom of Saudi Arabia and as such is the Nr. 1 company in the fight against MERS / CORONA VIRUS. No more discussions about air quality in my department!

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Providing unparalleled image quality

Article provided by Healthmark Inds

Healthmark Inds' Flexible Inspection Scope delivers unparalleled quality of image in an incredibly convenient and robust design. The scope is designed with a blue handle that includes a distal tip composed of a light source and camera lens at the end of a 110cm flexible blue shaft, which features white graduation marks. Manufactured for instruments 2.0mm in diameter or larger, the FIS-005 is the perfect tool to get a visualisation of any potentially soiled or damaged item.

The Starter Kit Software included, which installs on Windows 7, 8 & 10 PC's, powers the FIS-005 and allows for viewing, recording and documentation. The starter kit includes the scope, USB Drive and case.

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