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International Hospital Federation

World Hospitals and Health Services

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Facing up to hospital-acquired infections

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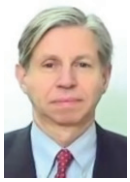

ALEXANDER S PREKER
CHAIR, EXTERNAL ADVISORY BOARD,
INTERNATIONAL HOSPITAL FEDERATION

In the early 20th century, being struck down by a serious illness that would require hospitalization was close to receiving a death sentence. The range of illnesses for which there were effective interventions was still narrow. Many of those that did not die at the hands of the surgeon were likely to become seriously ill and die afterwards due to hospital-acquired infections. The past century has seen more progress in this area than in the last few thousand years before this. Yet at the beginning of the 21st century, it sometimes seems all this progress is at risk of being wiped out by a new breed of aggressive and antibiotic-resistant microbes that are both hard to diagnose and sometimes impossible to treat.

This Issue of *World Hospitals and Health Services* is devoted to both old and new approaches to hospital-acquired infections (HAIs), ranging from simple preventive measures such as hand washing, to innovative antiseptic techniques, to new molecular level diagnostic tests and treatments with a new generation of antibiotics, immunological interventions and even talk of genetic engineering to enhance the body's own resistance.

In "National infection prevention and control programmes; Endorsing quality of care", the authors from the Pan American Health Organization (PAHO) summarize the approach taken by the World Health Organization. By working both with individual hospitals and national governments they advocate a double strategy of (a) building country capacity to respond to outbreaks of emerging or re-emerging communicable diseases and (b) containing the emergence of antimicrobial resistance. They emphasize how HIAs have once again become a major cause of morbidity and a serious cause of mortality. In addition to the pain and suffering of patients, they stress how HAIs increase health care costs through extended hospital stays, the use of additional drugs and other diagnostic and therapeutic measures, and how they generate indirect costs from loss of productivity for the patient and society as a whole.

In "Provoking 'Eureka' moments for effective infection control strategies", the author, from WHO in Geneva, describes the continuing importance of simple hand washing in controlling HAIs. He discusses new and innovative ways to encourage and monitor such practices.

In "Planning strategies for nosocomial infection control", the author from Italy explains how "prevention" can be built into hospital architectural designs, especially when focused on the critical areas of hospital design such as emergency departments, hospital wards, intensive care units, operating theatres and isolation rooms.

In the following article, "How can emerging disinfection technologies gain a foothold in the current culture of hospitals", the authors emphasize the significant advances that have been made in non-touch techniques (whole-room decontamination using vapours, aerosols, UV, etc.). In the United States, more than 90% of hospitals still use only the traditional "spray and wipe" disinfection methods initiated over a century ago, despite the well-demonstrated greater effectiveness of such techniques when combined with non-touch solutions (hydrogen peroxide with and without silver ions. They show how difficult it is to change the mindset of managers and staff in hospitals because of a lack of accountability for results in many clinical settings.

In "Nosocomial infections: Aligning strategy and action from mission to outcomes" the authors from Colombia, South America, describe how adherence to a simple indicator such as hand washing, requires a complex set of actions in the reduction, monitoring and enforcement of compliance. Despite the existences of talented individuals with clear motivation to serve their patients, only a small percentage of hospitals throughout the world achieve the benchmarks set by top institutions.

In "The urgent need for infection control programmes in Indian health care", the authors from India describe how health care-associated infections (HCAIs) in developing countries are two to 20 times higher than in developed countries. The article describes how the Clinical Infectious Diseases Society and others came up with "Chennai Declaration" in 2012 to address infections and antibiotic abuse. The article describes the implementation of this approach in one of the more progressive private hospitals in India.

In "Integrating electronic medical records to improve antimicrobial stewardship", the author from France describe how integrated electronic medical records for antibiotic prescriptions have been deployed successfully in his country. Improved information systems lead to more evidence-based practices allowing monitoring and control of both desirable and undesirable practices.

Finally, in "Business process re-engineering a cardiology department", the author discusses the slow uptake of process re-engineering in the health sector and the important gains that could be made in efficiency, effectiveness and cost through the application of well-tested approaches.

The International Hospital Federation is committed to working with international groups like PAHO/WHO, its national members and individual hospitals in the fight against hospital-acquired infections throughout the world. ❑

National infection prevention and control programmes: Endorsing quality of care

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ABSTRACT: Health care-associated infections (HAIs) are a major cause of morbidity and mortality. In addition to pain and suffering, HAIs increase the cost of health care and generates indirect costs from loss of productivity for patients and society as a whole.

Since 2005, the Pan American Health Organization has provided support to countries for the assessment of their capacities in infection prevention and control (IPC). More than 130 hospitals in 18 countries were found to have poor IPC programmes. However, in the midst of many competing health priorities, IPC programmes are not high on the agenda of ministries of health, and the sustainability of national programmes is not viewed as a key point in making health care systems more consistent and trustworthy.

Comprehensive IPC programmes will enable countries to reduce the mobility, mortality and cost of HAIs and improve quality of care. This paper addresses the relevance of national infection prevention and control (NIPC) programmes in promoting, supporting and reinforcing IPC interventions at the level of hospitals.

A strong commitment from national health authorities in support of national IPC programmes is crucial to obtaining a steady decrease of HAIs, lowering health costs due to HAIs and ensuring safer care.

Health care-associated infections (HAIs) are a major cause of morbidity and mortality. In addition to the pain and suffering of patients, HAIs increases health care costs due to extended hospital stays, use of additional drugs and other diagnostic and therapeutic measures, and generates indirect costs from loss of productivity for the patient and to society as a whole.

Traditional infection prevention and control (IPC) programmes are able to reduce upwards of 35% of HAIs. More contemporary programmes show higher rates of prevention. However, despite the high rates of HAIs and a demonstrated efficacy of infection prevention programmes, a large proportion of hospitals in the Americas lack trained personnel and/or established programmes to prevent HAIs. This paper, addresses the relevance of national infection prevention and control (NIPC) programmes in promoting, supporting and reinforcing IPC interventions at hospital level.

The World Health Organization (WHO) has long recognized problems related to IPC as crucial and have undertaken relevant initiatives. Many programmes of the Pan American Health Organization – WHO regional office for the Americas (PAHO/WHO) – such as patient safety, safe injections and occupational health, have been engaged in the different aspects of infection prevention and control (IPC). In 2004, PAHO/WHO set off a specific line of work in IPC based on a double strategy: 1) containment of antimicrobial resistance, and 2) building country capacity to respond to outbreaks of emerging or re-emerging communicable diseases. From this perspective, IPC programmes at hospital and national level became the cornerstone for early identification and control of outbreaks, to decrease the burden of HAIs *(1)*, and to improve quality of care in a sustainable way.

Many tools have been developed to support countries for self-evaluation of IPC programmes at national and hospital levels *(2)*. Since 2005, PAHO/WHO has provided support to countries for the assessment of their capacities in IPC *(3)*. More than 130 hospitals in 18 countries were found to have poor IPC programmes and despite huge efforts on their part, results continue to be poor due to gaps in leadership and management.

Despite this situation, many countries have begun to deal with the problem in many different ways that range from formal organization of national IPC programmes to the publication of guidelines, protocols and regulations.

Comprehensive IPC programmes, jointly implemented with international health regulations (IHR) *(4)*, will enable countries to reduce the mobility, mortality and cost of HAIs and improve quality of care. The IHR require Member States to notify WHO of events that may constitute a public health emergency of international concern. Likewise, infection-control practices in health care must be in place for the purpose of containment following these events.

Core components

WHO's initiative on IPC aims to assist Member States in promoting

high quality health care with a low risk of HAIs to patients, health care workers and all people associated with health care settings in a cost-effective manner. In this effort, WHO has identified essential programme components for IPC deemed to be key in the development of IPC programmes at different levels of the health care system. A total of eight core elements were identified *(5)*:

- organization of IPC programmes;
- guidelines;
- human resources;
- surveillance of infections and assessment of compliance with IPC practices;
- microbiology laboratory;
- environment;
- monitoring and evaluation of IPC programmes;
- coordination with other public health stakeholders.

The national health authority should, directly or by delegation, regulate, provide guidance, promote and supervise compliance with regulations. At the local level (e.g., hospitals), care must be provided in a safe and efficient manner for patients, health care workers and others. The IPC components of national level and local level programmes should be aligned and consistent, and may differ according to the type of care provided. As per the WHO Core Components, the national level is responsible for the coordination and leadership of the programme and must take specific actions in order to build an effective IPC programme at country level, such as preparedness and coordination of IPC measures for containing the spread of communicable diseases, development and dissemination of guidelines for prevention and management of infections in hospital or related to hospital procedures, definition of contents for training of health care workers (HCWs) and IPC professionals, HAIs surveillance and reporting and definition of the minimum environmental requirements for IPC.

Historical evolution of national infection prevention and control in countries of the Region of the Americas

The first national IPC programme in the Region of the Americas was launched in the United States, led by CDC in early 1970s, followed by Chile and Cuba who started their programmes in the early 1980s, Argentina and Brazil in the 1990s and Uruguay, Costa Rica, Colombia and Ecuador in 2000.

In the Region of the Americas many different combinations can be found with regards to leadership of the IPC programme, they range from countries with strong national and hospital programmes to countries with very weak programmes and between these extremes, a large spectrum of possibilities. Some countries have attempted to run national programmes, others have instituted regulations and guidelines on IPC, hospital hygiene and occupational exposures *(6)*; in general all countries have, in some way, programmes for the prevention of hospital-acquired infection.

Functioning national programmes: A positive impact on the quality of care

The presence of an IPC programme at hospital level is well known to be effective in reducing at least 32% of hospital-acquired infections *(7)*. The state-of-the art in this field is aimed at the elimination of HAIs *(8)* where well-structured IPC programmes exist at all levels (health care settings and central level) and is well supported.

However, published evidence on the effectiveness of national programmes to prevent HAIs and the subsequent improvement of quality of care is scarce. National programmes for IPC have many components as discussed earlier, however the main goal is always the same: to decrease the number of HAIs in patients, health care workers and visitors to hospitals and other health care facilities.

Probably, the best documented strategy to archive these goals is the establishment of a national surveillance system; however, it is not the only strategy. In 2012, the Agency for Healthcare Research and Quality of the United States Department of Health and Human Services published a report *(9)* showing that adherence to good practices and infection rates can be improved through the implementation of audits and feedback of results. Audits and feedback are also two core components of national infection control programme as stated by WHO *(4)*.

The United States programme led by CDC since 1970, has resulted in the decrease of HAIs rates and has been a good instrument of advocacy and support at the state level. Recent data shows that since 2008 when the national programme was launched, (National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination *(10)*), there has been a 44% decrease in central line-associated bloodstream infection and 20% decrease of surgical site infection. It is also important to highlight that the data showed a 3% increase of catheter-associated urinary tract infections that triggered a national effort to tackle this problem.

In Chile, the Ministry of Health has led the national programme since 1983. Beside gains in compliance with the national normative after systematic hospital IPC programmes evaluations (personal communication), the HAIs rates has consistently decreased. For instance, between 2000 and 2012, ventilator-associated pneumonia has decreased 18% in adults, 36% in children and 15.2% in newborns. Post-delivery and C-section endometritis decreased 58.4% and 59% respectively during the same period of time. The lowest decrease was experienced in catheter-associated urinary tract infection in ICU patients, a reduction of about 6.5%.

Another well documented example is the German national nosocomial infection surveillance system (KISS). KISS reported effectiveness in the reduction of HAIs rates after the inception of national surveillance in 1997 (29% reduction of cases of ventilator-associated pneumonia, 20% reduction in CR-BSIs and 28% reduction in SSIs *(11)* in 3 years).

Aside from achievements in surveillance and the reduction of rates, is the complex situation that countries' face when a new multidrug-resistant bacteria emerges. Successful strategies based on a strong national approach *(12, 13)* highlight the other important role of National IPC programmes. The coordination of preventive activities in hospitals countrywide is very important and the referral of patients between health services.

The other important function is the development and dissemination of national guidelines for IPC, mostly on prevention of HAIs. National programmes generate a positive influence on IPC practices at hospital level through the dissemination of such standards and guidelines.

From our experience, without national programmes, progress will be slow and much more costly. However, national programmes for IPC in isolation are not enough to propel all the improvements needed at hospital level. The effort needs to be mirrored at the level of the hospital.

Sustainability, challenges and future directions

As discussed, the presence of well-functioning national IPC programmes provides the necessary back up for the development and support of hospital initiatives (i.e., committees, programmes). National guidelines disseminated at local level are, in most instances, the only technical resource for hospital programmes. Surveillance systems coordinated at national level have a positive effect on the sustainability of hospital HAIs surveillance, and the periodic dissemination of results have an impact on decision-making. Hospital-based infection-surveillance systems should be linked to the public health infection surveillance system; information regarding diseases of potential concern should be reported immediately to public health authorities. This is in agreement with the requirements of the 2005 IHR.

National IPC programmes should be periodically evaluated to assess the extent to which objectives are met, goals accomplished and whether activities are performed according to requirements while identifying aspects that may need improvement. IPC policies should encourage improvement and promote learning from experience in a non-punitive institutional culture, therefore contributing to better patient care and quality outcomes.

The dialogue on health care-associated infection is only now beginning in many countries of the Region of the Americas. Ministries of health are very interested in developing this topic as a quality indicator of health care services or as core capacity for full implementation of IHR. In any way, the implementation and support of a national programme at central level is cornerstone to the achievement of these goals.

In the midst of many competing health priorities, IPC programmes are not always high on the agenda of ministries of health *(14)*, though it should be considered as a strategic tool for achieving quality delivery of health services. The sustainability of national programmes is another key point in making the system more consistent and trustworthy.

Currently, the major challenge is fostering a culture of safety at all levels, national, local as well as at the hospital level *(15)*. This means building a safer health care system with quality clinical practices and based on country priorities and IPC is part of this strategy.

Finally, national IPC programmes will not be able to drive important and sustainable improvements in the safety of health care services if HAIs are not seen as a public health problem; IPC programmes are not treated as a priority; and mechanisms to ensure continued allocation of resources for the programme are not effective. A strong commitment from national health authorities in support of national IPC programmes is key to obtaining a steady decrease of HAIs, lowering health cause due to HAIs and ensuring safer care. ❑

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Provoking "Eureka" moments for effective infection control strategies

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ABSTRACT: Safety is now a fundamental principle of patient care and a critical component of quality management. Health care-associated infection prevention strategies need to be constantly revisited and updated to be effective. The "Geneva hand hygiene model" is a typical example of a breakthrough innovatory campaign that caught fire and went viral worldwide, thanks to its adoption by the World Health Organization (WHO) as the First Global Patient Safety Challenge. The campaign remains an inspiration for further innovation. To encourage new and disruptive technologies with the potential to improve patient safety through the successful implementation of the WHO multimodal strategy, the University of Geneva Hospitals/WHO Collaborating Centre on Patient Safety, together with the Aesculap Academy, have created a series of "Hand Hygiene Excellence Awards" and "Hand Hygiene Innovation Awards" worldwide.

Since antiquity, health care-associated infection has been a reality and a source of suffering for countless millions of patients and their families worldwide, but patient safety has only really become a major topic over the past 10–15 years. Despite a body of constantly expanding research, many questions still remain. For example, the reasons for the uneven geographic distribution of infection rates are not fully understood, notably the striking differences in the epidemiology of nosocomial infections and multiresistant bacteria between the United States and Europe. Disparities may be explained by several determinants:

- surveillance methods, including diagnostic practices and laboratory recognition;
- infection control practices;
- antibiotic prescribing practices;
- population characteristics and patient case-mix;
- cultural factors (e.g., human behaviour);
- factors related to the health care systems and available resources;
- political commitment.

Clearly, the effects exerted at the macrolevel by the health care system and the political environment contribute substantially to the observed differences in infection rates, but these should serve also as an additional incentive to drive forward innovation and creative thinking for new preventive strategies.

Current conceptual thinking on patient safety places the prime responsibility for adverse events on defects in system design, organization and operation, rather than on individual providers or individual products. Most adverse events, such as health care-associated infection, are not the result of negligence or lack of training, but rather occur because of latent causes within systems. Safety is a fundamental principle of patient care and a critical component of quality management. Infection control is the entrance door to patient safety and innovative strategies need to be developed. However, most great ideas are not the result of a flash of inspiration – they are rather the result of hard efforts, team work and conflict. "Eureka" moments do not happen overnight.

The Geneva hand hygiene model: A breakthrough innovation

In the mid-1990s, initial observation studies in Geneva showed a low compliance with basic hand hygiene practices and a lack of awareness by health care workers that the main cause of cross-transmission of microorganisms is by hands *(1)*. Time constraint was identified as the major determinant for poor compliance *(2)*. The challenge was to facilitate hand hygiene for staff and to find an innovative way to do so. We tried to think out of the box and to see if perhaps there were sources of inspiration outside the infection control field. This led us to investigate concepts from the social sciences to help understand the main determinants driving health care worker behaviour and that led to the creation of a multimodal strategy. My own "Eureka" moment was when I realized that the key component was obviously the introduction of alcohol-based hand rub at the point of patient care to replace handwashing at the sink ("system change"), thus bypassing the time constraint imposed by handwashing *(3)*.

Driving commitment to fight health care-associated infection

The first multimodal intervention ran from 1995 to 1998 at the University of Geneva Hospitals with a spectacular decrease of 50% in hospital-associated infections and almost 80% in methicillin-resistant *Staphylococcus aureus* transmission in parallel with a sustained improvement in compliance with hand hygiene. The methodology and results were published in the *Lancet* in 2000 with a tremendous impact and the strategy soon became known in the scientific literature as "The Geneva hand hygiene model" *(3)*. Furthermore, the strategy proved to be largely cost-effective when

assessed after eight years, with cost savings reaching US$ 24 million per year in the early phase *(4)*. In 2002, the United Kingdom converted to "The Geneva model" and built up the national CleanYourHands campaign, which proved to be both successful and cost-effective. Today, for US$ 1 invested, the return on investment is at least US$ 20.

In 2004, I was approached by the World Health Organization to disseminate and export our multimodal strategy worldwide under the banner of the WHO First Global Patient Safety Challenge "Clean Care is Safer Care" *(5)*. The mandate was to galvanise global commitment among nations and policy-makers to tackle health care-associated infection, which had been identified as a significant area of risk for patients in all 194 Member States, with hand hygiene as the cornerstone of the Challenge. In 2009, WHO added a "Save Lives: Clean Your Hands" initiative that attracted the adhesion of more than 17,000 health care facilities worldwide as of May 2014. Among the flagships of the implementation strategy, the two most popular cues for action are the posters promoting "When to handrub" – as described in "My five moments for hand hygiene" *(6, 7)* and now translated in more than 100 languages throughout the world – and "How to handrub", now featured in more than 100 hand hygiene dance videos from all continents (see videos *(8,9)*) (Figures 1 and 2).

Figure 1: My 5 moments for hand hygiene

Table 1: Hand hygiene excellence award winners

Region	Year	Health care institution
Asia Pacific	2010	Artemis Health Institute Haryana / India
		Monash Medical Centre Clayton (VIC) / Australia
	2011	Dr Sardjito General Hospital Yogyakarta / Indonesia
		National Taiwan University Hospital Taipei City / Taiwan, R.O.C.
	2012	Bethesda Hospital Claremont (W.A.) / Australia
		West China Hospital of Sichuan University Sichuan / R.O.C.
		Cho Ray Hospital Ho Chi Minh City / Viet Nam
		Hong Kong Baptist Hospital Kowloon / Hong Kong, S.A.R
Europe	2013	Mater Private Hospital Dublin / Republic of Ireland
		Spitalul Sf. Constantin Brasov / Romania
Latin/Central America	2014	86 applications have been received
		The Award will be presented in August 2014

www.handhygieneexcellenceaward.com

Promoting a climate to inspire inovation and improve infection control

To encourage new and disruptive technologies with the potential to improve patient safety through the successful implementation of the WHO multimodal strategy, the University of Geneva Hospitals and the WHO Collaborating Centre on Patient Safety, in conjunction with the Aesculap Academy, have created a series of "Hand Hygiene Excellence Awards" and "Hand Hygiene Innovation Awards" worldwide: in the Asia-Pacific region since 2010, in Europe since 2012, and in Latin America in 2014. These Awards are conceived as a platform to identify, recognize, honour and celebrate those hospitals and health care worker groups who have contributed to improving patient safety through their excellence, enthusiasm and innovatory methods. A unique process has been developed for the Awards. First, the hospitals use the WHO-developed Hand Hygiene Self-Assessment Framework (http://www.who.int/gpsc/5may/hhsa_framework/en/), a systematic, validated tool to obtain a situation analysis of hand hygiene promotion and practices within an individual health care facility *(10, 11, 12)*. Based on their score and other criteria, selected hospitals are visited by two members of the international panel of leading infection control experts. Finalists then undergo a half-day visit of experts for further evaluation of their programmes against set criteria for creativity, innovation and local/regional leadership. A large number of tools, based on evidence and the results of implementation worldwide *(13, 14)* are available for health care settings to improve their scores towards achieving excellence in patient safety. Award winners in the respective regions are listed in Table 1.

Another innovation has been the designation of Global Hand Hygiene Expert Centres by the WHO Collaborating Centre on Patient Safety in recognition of outstanding efforts to promote hand hygiene excellence. In 2011, the Singapore General Hospital (Singapore), Queen Mary Hospital (Hong Kong, S.A.R), and the Austin Health Hospital (Australia) received this nomination for the Asia Pacific region. In June 2013, The Charité University Hospital (Berlin, Germany) received the award for the Europe region. Experts from these centres visit hospitals in their regions to allocate excellence awards and suggest further improvements.

Mobilizing patients and raising public awareness

Among the next challenges to improve patient safety are considering patients as partners and raising public awareness of the critical importance of optimizing both institutional systems and

Figure 2: How to handrub

health care staff behaviour. The odyssey of hand hygiene promotion has been recently addressed in a book for the lay public authored by the French writer Thierry Crouzet and published on 5 May 2014 – WHO World Hand Hygiene Day – in six languages *(15)*. The foreword of the book is co-authored by Dr Margaret Chan, WHO Director-General, and Sir Liam Donaldson, WHO Patient Safety Envoy. The book reveals also a new path open to human society, from a predatory economy system to an economy of peace.

Conclusion

Strong advocacy and leadership with an inherent innovatory capacity are required to maintain patient safety high on the political agenda, particularly in resource-poor countries where there are many competing priorities. The challenge is to develop strategies and campaigns with a potential for adaptability to diverse cultures and varying resources. ❑

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Global Catalyst Group for Institutional Health Partnerships

Position Statement

MARCH 2014

The Global Catalyst Group for Institutional Health Partnerships provides a "bridge" between multiple organizations across the world experienced in the partnership based approach to improvement.

The overall purpose of the group is to promote the utility of institutional health partnerships in strengthening health systems and in delivering effective health services through resources, positions statements and collaborative activities.

APPS
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THE EUROPEAN ESTHER ALLIANCE

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PARTNERSHIPS FOR GLOBAL HEALTH

Institutional Health Partnerships, as described in this Position Statement, have the capability to address the critical shortage of adequately and appropriately trained health workers in developing countries. They are able to develop capacity through institutional and peer-to-peer relationships in a sustainable way. A principle-centred approach is at the heart of health partnerships. Respect and the promotion of the principles of the Paris declaration on Aid Effectiveness (ownership, alignment, harmonization, managing for results, mutual accountability) together with the principles of high quality partnerships (reciprocity, equal responsibility, equity, respect, capability, transparency and ethics) provide the fundamental building blocks of effective health-care partnerships.

- **Institutional health-care partnerships can play a critical role in multiple areas of global health systems strengthening as the global health arena develops rapidly.**
- **Hospital-to-hospital partnerships have been utilized for technical exchange between health workers and in catalysing improvement in health care for a number of decades.**
- **Institutional health-care partnerships (including hospital partnerships) provide a mechanism to motivate and develop the health workforce.**
- **Such partnerships are key in establishing long lasting inter-individual professional relations that can support capacity development beyond the scope of projects.**
- **Institutional partnerships provide a channel for bi-directional learning and co-development in rapidly evolving global health systems.**



1. Health systems strengthening depends on multiple inter-related approaches and mechanisms. In 2011, a report by the WHO secretariat to the 64th World Health Assembly on current trends and challenges in health systems strengthening highlighted the importance of inter-country exchange, joint learning and institutional twinning. [1] National policy documents over the past decade have also highlighted the potential for institutional partnerships to be a key contributor to global health system co-development.[2] Indeed, hospital-to-hospital partnerships have been utilized for technical exchange between health workers and in catalysing improvement in health care service improvement for a number of decades.[3]

2. Health workers are at the core of all health systems.[4] Developing countries face a critical shortage of appropriately trained health workers alongside issues of motivation and retention. Hospital-to-hospital partnerships provide a direct channel between front line health workers that can provide much needed support in technical areas, as well as providing a mechanism for externally driven motivation. Health worker isolation – particularly in remote areas – can be mitigated through exchange mechanisms as part of institutional partnerships. Indeed, institutional health-care partnerships involving front line health workers can support efforts in redressing the imbalance in service delivery.

3. The safety and quality of health service delivery is a critical component of health systems strengthening.[5] Indeed, building confidence in high quality services has been highlighted as critical to the success of evolving universal health coverage (UHC) systems across the world. [6] [7] Exchange mechanisms with a focus on health worker capacity can be harnessed to trigger and sustain best practices on the safety and quality of service delivery. Further, institutional partnerships provides a mechanism for cross-fertilization of approaches in fast evolving UHC systems.

4. The rapidly increasing burden of disease attributable to **non-communicable diseases (NCDs)** necessitates an urgent re-alignment of health services in developing countries towards integrated people centred care with a focus on prevention.[8] However, many health systems and the health workers within them are ill-equipped to face the challenge of chronic conditions. Institutional health-care partnerships can provide a channel for transfer of "NCD know-how" between countries. This has the potential to be wider than the traditional twinning of health facilities and can potentially include institutional partnerships between public health institutions.

5. Primary health care underpins health systems in all countries. Future primary care systems will require reform in four key areas: universal coverage; service delivery; public policy; and leadership.[9] All four of these areas can benefit from harnessing the power of inter-country partnerships between relevant institutions. For example, established post-graduate institutions focused on primary health care can partner closely with evolving post-graduate institutions.

6. Numerous institutional partnerships operate in developing countries, making **partnership coordination** a critical success factor in improving the service delivery system as a whole. At the very minimum, effective communication channels between "partnership improvement experiences" and national ministries of health are key in ensuring national level alignment. Establishment of country-based institutional partnership platforms can also be useful in ensuring efforts involving multiple high-income country partners are synergistic.

7. The evidence-base on the utility of institutional health-care partnerships in improving health systems capacity is emerging. Formal evaluation mechanisms are being utilized to enhance the knowledge base on the merits and demerits of the approach. There is a clear need to build on these early efforts to further develop this field of enquiry, including validated costing and economic evaluation of the use of institutional health-care partnerships.

8. Global innovation flow is critical in driving improvement in global health systems. Innovation flow from north to south is well recognized. However, examples of innovation flow from "south to north" exist in all six WHO health systems blocks.[10] Innovation flow in all directions (north-south; south-south; south-north) can be fostered through the channel of institutional partnerships. [11]

9. Health partnerships can foster effective ways of utilizing **health technology** to build frontline capacity for health workers. In particular, the contribution of E-health can be channelled effectively through health-care partnerships. Further, technology transfer can be enhanced through health partnerships.

Conclusion

There is an increasing body of evidence that institutional health-care partnerships are an effective channel to strengthen health systems through harnessing the passion and energy of individuals. Such partnerships and the resultant human interactions at the heart of the model can form a critical component of bilateral and multilateral cooperation in global health.

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Planning strategies for nosocomial infection control

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ABSTRACT: According to the American Centers for Disease Control and Prevention, 99,000 deaths per year in the United States are caused or impacted on by multiple hospital-acquired infections (HAIs), which are roughly estimated to be around 1.7 million cases. In Europe, there are 25,000 deaths per year from the same cause, 17.000 of which are linked to nosocomial infections. Patient safety is a core issue in today's health care settings. There is a growing consensus, supported by scientific investigation, that the role of the built environment is central towards minimizing and controlling the level of such infections.

The contribution of architectural solutions and planning choices becomes crucial at this stage. This paper outlines the most common measures to adopt at the architectural and planning level, to combat HAI, focusing on the most critical areas of the hospital: wards, intensive care units and operating theatres.

MRSA, methicilin-resistant *Staphylococcus aureus*, is only one of the so-called multidrug-resistant pathogens that characterize the spectrum of multidrug resistant organisms (MDROs), which are the origin of nosocomial infections. Recent findings depict a rather disturbing scenario on the rising level of risk factors for infections by MDROs in health care-associated infections. The initiation of the disease process regarding nosocomial infections is dependent upon the alteration of a weak equilibrium which lies between pathogens, patients and the environment. Whether hospital hygiene protocols are respected or not, there is an important role played by the way the hospital environment is physically shaped. The spread of infections and its control can, therefore, be influenced by hospital architecture.

Patient safety is a core issue for health care planners, policy-makers, and hospital managers nowadays. However, only a few hospitals in developing countries are designed on the basis of scientific evidence (edb). Linking hospital design and construction with the prevention of nosocomial infections becomes a challenge that can be won only through cooperation between hospital authorities and specialist design companies. The position of hand washing facilities, the right amount of space within a room, the division of septic and clean workflows, the use of sluices and the prevention of overcrowding in wards are only few of the spectrum of solutions that can be adopted in order to influence the control of hospital acquired infections. Figure 1, shows a recent survey conducted by the World Health Organization, on the percentage of new tuberculosis cases associated with MDR. This is rather shocking.

The same reaction could be provoked by analysing the map of the incidence of MRSA in human blood samples in European countries (Figure 2).

These data are the premises which motivate a common awareness of the importance of minimizing the effect of such infections within health care settings as seen from a safety perspective. But what can really be done by hospital planners and architects? Can architecture really support infection minimization? Despite all the national regulations and hygiene protocols, which are quite different from country to country, there are certain planning rules that health care architects follow during the design process. The control of nosocomial infections is an issue for the entire hospital building, but there are certain areas where a higher level of attention is required. Operating theatres (OT), intensive care units (ICU), central sterile supply departments (CSSD), the dietary laundry and laboratories are some of the most common areas where the attention of health care planners towards infection control are most needed. This paper, aims to outline the design strategies to adopt to reach a higher level of control of the development and spread of hospital-acquired infections.

Common planning guidelines

Health care facilities, and hospitals above all, are characterized by a varied population of users, each with a different health status. There are patients that need treatment, but also medical and service staff, visitors and other external parties that are healthy and have to work in an environment which has to be safe for them as well. Often some of these different categories of people share the same spaces and the potential risk of cross infections becomes relevant. The first basic challenge for health care planners becomes the avoidance of mixing of patient flows. This is achievable *in primis* by respecting a functional segregation of the macro areas of a hospital: outpatient departments (OPD), inpatient units, diagnostic and treatment (D&T) departments. Within these macro areas, the allocation of functional units, their proximity and adjacency, play an extremely important role which has to result in a smart zoning system, which is later supported by an efficient ventilation system.

Figure 1: The percentage of new TB cases associated with MDR

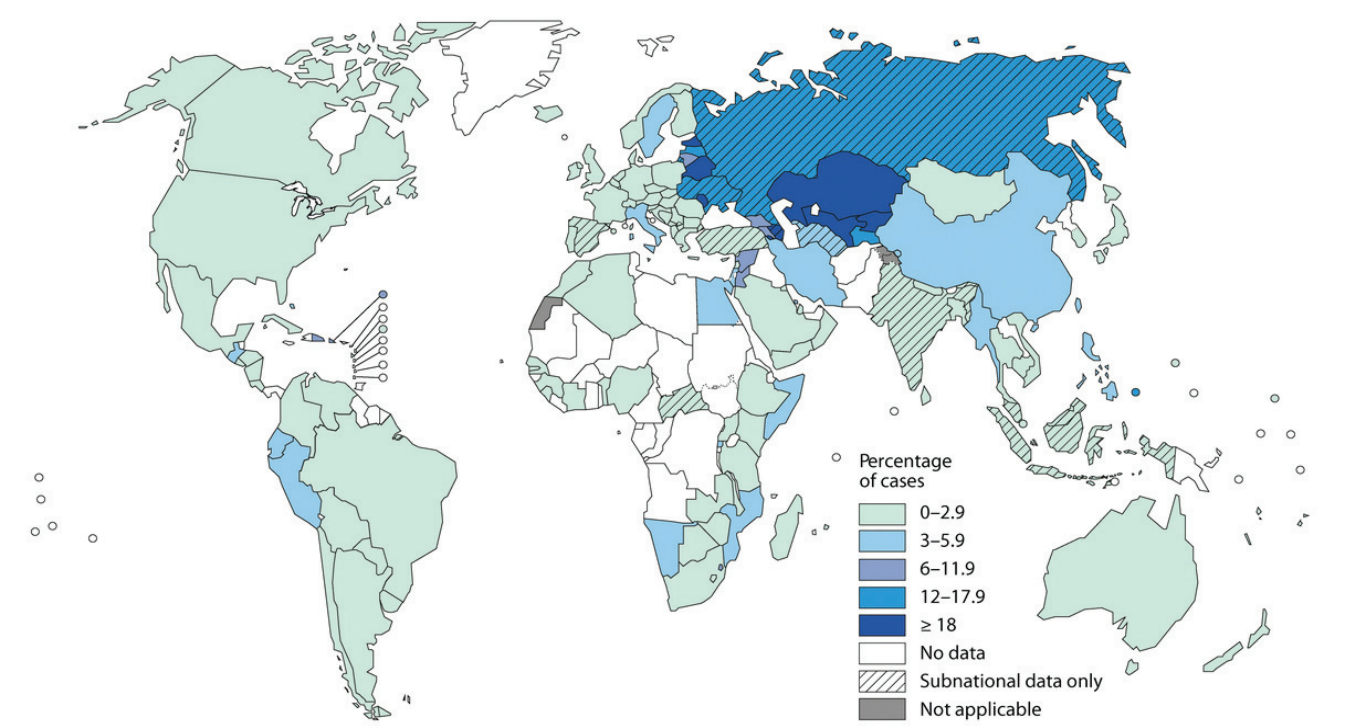
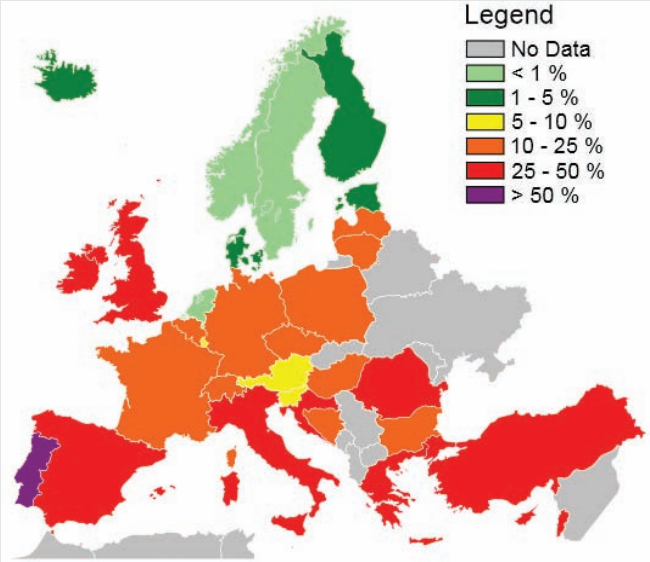


Figure 2: Incidence of MRSA in human blood samples



Applying a clear zoning structure can have a direct impact on the traffic division (soiled and clean, public and private) and on the consequent avoidance of congestion. These parameters are of paramount importance, for example, for the location of OTs and ICUs which have to be kept away from public traffic and air flows coming from other potentially infected areas such as laboratories and wards.

Usually a clear distinction among logistics, medical and public flows has to be embedded and clearly visible within the plan, so that soiled and clean workflows are located within specifically addressed corridors not adjacent to each other. Isolation wards have to be kept out of routine circulation, and the same has to be applicable to isolation rooms at ward level.

Experts often claim it is enough just to strictly respect hygiene protocols to control hospital infections. On one hand this is true; on the other hand, it is also true that a specific arrangement of the architectural layout can raise the probability that hygiene protocols are not neglected. Hand washing, for example, is the most basic and important step within hygiene protocols. A hospital's routines, stress and lack of time may result in neglect of such an important basic step. It is the responsibility of the health care architect to design a layout where the wash basins are visibly accessible to the medical staff.

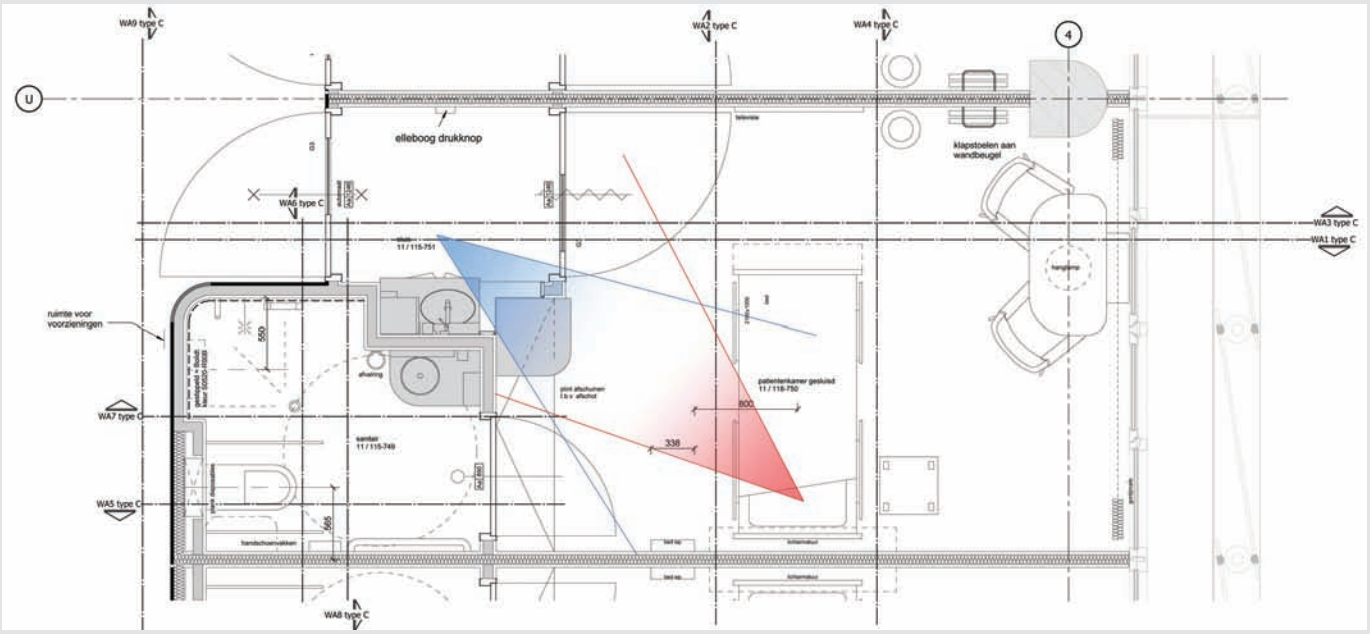
Air lock curtains and sluices are also often used to prevent the spread of nosocomial infections, especially in critical care areas where patients normally have a low immune defence system.

The new challenges for hospitals wards

The limits of hospital wards, and above all the acute wards, are continuously challenged as current debates testify. Comfort, patient support and safety are important keywords for these spaces. Safety also includes the risk of getting communicable diseases in health care settings. Principles of asepsis and hygiene protocols need to be constantly supported by design considerations.

As previously mentioned, the location and number of wash hand basins (WHB) can encourage medical staff to practice hand washing. It is important, therefore, that the WHB is the first element that the medical staff meet on their path when entering the patient bedroom. Moreover, in a patient supportive perspective, it is also important that patients themselves can directly watch the medical staff washing their hands before any procedure starts. This concept was applied to the new wards of the Erasmus Medical Center (EMC) in Rotterdam, a pioneering project in the European health care panorama designed according the latest ebd findings. The solution used for the new wards of the EMC proved very

Figure 3: The design for the new wards at the Erasmus Medical Center in Rotterdam, the Netherlands



successful both for patients and medical staff.

When planning hospital wards, it is also important to keep the number of multiple bedrooms to a minimum. The best situation would be to have an all single bedroom solution. Relevant previous studies have shown that increasing the number of beds in multibedrooms was associated with a significant increase in the nosocomial infection rate.

Ideally, each bedroom should be equipped with its own hand washing facility. However, to have wards consisting entirely of single bedrooms each with its own hand washing facilities is a solution not yet adopted even by some of the most developed countries in the world. This means that pavilion wards are still in use and the number of single bedrooms may be based on the number of other beds located in the pavilion itself. Certainly, when talking about pavilion wards we should not think to the number of beds which were present during Florence Nightingale's time. It might be better to simply call them multibedrooms with a maximum of 8–10 beds, which in some exceptional cases may be more.

An efficient air circulation system is also extremely important to prevent transferable diseases. HVAC systems are nowadays very efficient; however some experts support the use of clean natural air which is not mechanically controlled.

A recent survey by English researchers proved the significance of providing air circulation within the bedroom through opening simple windows. Providing air circulation through the natural ventilation system registered positive results in terms of reduction in the numbers of bacteria present in the bedroom environment. Therefore, equipping bedrooms with windows, which can be opened, is highly recommended. Isolation rooms, instead, should be planned to accommodate a sluice or air lock system which maintains a pressure difference between the two environments: the bedroom and the environment external to it.

The American Center for Disease Control and Prevention provided a checklist for planning isolation rooms. The checklist refers to three classes of isolation: S, N, P. The "S" class encompassed standard isolation conditions and is specifically focused on patients who require contact or droplet isolation. The "N" class, which stands for negative isolation, is focused on patients requiring airborne droplet nuclei isolation. The "P" class, positive isolation, is devised for deeply immunocompromised patients, such as oncology or transplant patients.

In this kind of special room a specific space should be provided to keep urine, stool samples of patients and also for disposal, washing and storage of contaminated materials such as soiled linen, as well as a place to mix disinfectant solution and place bedpans.

Planning critical spaces: The ICU

The last considerations on isolation rooms should concern the planning of ICUs.

More space per bed, more single bedrooms and better sanitary facilities are normally the aspects to consider when evaluating the impact of design solutions on hospital infection rates. In 1995, Vincent et al. reported that patients treated in ICUs with more than 11 beds had a higher risk of acquiring nosocomial infections than

Table 1: American Center for Disease Control and Prevention checklist

	Class "S"	Class "N"	Class "P"
Handwash basin room	Yes	Yes	Yes
Ensuite bathroom (shower, toilet, WHB)	Yes	Yes	Yes
Door with door closer	Yes	Yes	Yes
Airlock	–	Yes	Optional
Sealed room, door	–	Yes	Yes
Pan sanitizer (near room)	Optional	Optional	Optional
Independant exhasut	–	Yes	–
HEPA filters on supply		–	Yes
Air changes/hour	–	6–12	6–12

patients treated in ICUs with fewer than six beds. This stresses the importance of laying out ICUs on the basis of single bedrooms where possible. The impact of such a choice on decreasing nosocomial infections has already been statistically proved some time ago and it continues to be supported by recent studies.

The American Institute of Architects (AIA) sets the minimum number of hand washing facilities in ICUs for patients as one in the toilet room plus a sink in the patients' room.

Sinks need to be accessible and the surfaces made of nonporous materials in order to resist fungal growth. The use of copper has been recently proved to be exceptionally efficient against bacteria. However, costs considerations may prevent hospital managers from using large quantities of this expensive material.

Space beneath the WHB should not be used for storage because of the proximity to sanitary sewer connections and possible leaks. In the case of multibedroom ICUs, there is a common awareness among planners that there should be at least 14m^2 of floor space per bed with adequate space for a head unit and sterile supplies. Isolation cubicles must be provided with self-closing doors and air locks.

The use of air locks and sluices are particularly relevant to create a protective barrier against the entrance and exit of contaminated air into the isolation cubicle where protective clothes can be worn without contamination prior to entering the room.

A15Pa positive pressure gradient between the isolation cubicles and the rest of the ICU environment is recommended by most common international standards, with 15 air changes per hour (five fresh and 10 re-circulations).

Not every country in the world agrees upon the use and net space needed for a sluice antebedroom.

Some western European countries, such as the Netherlands, require the sluice be measured on the basis of accommodating an entire bed plus medical personnel: 2.40 m is the average length of an air locked anteroom. If hand washing facilities are normally directly located in the bedroom just after the sluice, it is not uncommon to see in some pioneering projects the same facilities directly located within the anteroom. By doing so, the medical staff is already clean before they enter the core of the isolation cubicle. Furthermore, other kinds of air lock may be provided via so called air curtains. These systems consist of a downward-facing, blower fan mounted over a door, blowing air across the surface of the opening. This system, mostly used in United States, when applicable, can substantially reduce the amount of space normally needed for a common sluice.

However, there are several differences among countries when planning of ICUs which mostly belong to health care cultural approaches. These may result in a fragmented scenario for an external observer.

Planning OTs to reduce infection risk

Surgical departments and their operating rooms (OR) are supposed to be the cleanest and most isolated rooms in the hospital. The reasons are easily understandable because of the nature of the activities that normally are carried out in those spaces. The location and design of OTs, ventilation, temperature, hygiene protocols, the use of protective clothes and cleaning procedures are considered globally the most important factors affecting the outbreak of infections in operating settings. Also in planning operating theatres, there are several differences that arise from the health care culture background in different countries.

Normally, the entrance into a surgical department is marked by an air lock sluice that isolates the operating environment from the general one. Inside the surgical department, the location of the preparation rooms, of the OR, the position of hand washing facilities and the availability of soiled and clean corridors become crucially important. The room where the sterile material and tools are stored and unpacked before the operation starts is normally located in the middle of the surgical department, so that it can serve all the operating theatres from a centralized position. In this case, all the medical staff have a common entry point via the main entrance to the department. Some experts claim that in order to raise the level of infection prevention, the workflows of nurses, anesthesiologists and surgeons must be separated prior to entering the OR. Such views are directly linked to the way the operating settings are managed, which may differ from country to country. For example, in the Netherlands, it is common that one anaesthesiologist operates over two or more operating rooms.

By moving from one OR to another, the risk of bringing infection from that environment to another, is quite high. If this movement occurs through the central sterile hall, where the sterile material is unpacked, then there is a potential risk of spreading infection on the tools that will be used for the next operation. For this reason, some Dutch hospitals, such as the Jeroen Bosch in 's-Hertogenbosch, decided to adopt a particular design solution which took into account this potential risk from the mobility of medical staff within the surgical department. The architects who designed this modern hospital decided to relocate the space where the sterile material is unpacked to a specific room located between the two operating theatres. This special room has direct access to the OR, but it is filtered from the general departmental common corridor by a sluice room. This makes the procedure of unpacking the operating material and its room, the cleanest in the entire hospital environment and the most protected from potential risks due to the mobility of the medical staff.

This kind of solution also encompasses a division of workflows between the surgeons and other medical staff. In the Jeroen Bosch OR, the surgeon passes through a small room adjacent to the OT, specifically addressed to the hand washing procedures, before entering the operating theatre. This room is only intended to be used by surgeons. All the other medical staff, enter the operating theatre from the main access door.

There is a tendency, in countries like the Netherlands, to over use the space for sluices. This is obviously due to the way operation procedures and health care policies are conceived. In the Nordic European countries, such as Finland, every room has its own team including the anesthesiologist, who has no reason to move from one OR to another. Therefore, once the complete team is assembled within the OR, nobody moves from the OR until the operation is completed. In this kind of context, only the strict application of hygiene protocols is required to avoid the spread of acquired-hospital infections. Concerning corridors and their division in soiled and clean ones, there is an important consideration to bear in mind. Not all the hospitals have adopted this solution, and it is actually not true that unique corridors lessen the potential risk of the spread of infections. If waste or contaminated material is packed and sealed before leaving the OR, there is no need for an additional external corridor.

The American MASH (Mobile Army Surgery Hospital) model is still a perfect basic model to get inspiration from, above all in terms of protection against bacteria generated by the operating team and patients in the OR by using appropriate air volume changes and flows.

However there are common rules that planners observe worldwide for designing surgical departments. A sequence of increasingly clean zones from the entrance of the surgical department until the theatre are aimed at reaching absolute asepsis at the operating site is commonly planned.

The creation of an air flow pattern that carries contaminated air away from the operating table. The use of different air pressures as a tool to prevent less clean air entering the operating theatre. Moreover, no shelves should be present in the operating theatre and high attention has to be given to the choice of floor surface materials. Epoxy resin flooring is highly used, but in United States some hospital authorities have also recommended marble slabs with copper strips, since they have been found to be seamless, scratch proof, stain free and antistatic. Besides the OR and a separated sterile zone, one separate dedicated AHU aimed at maintaining a positive pressure gradient has to be taken into account.

Conclusions

The role of the physical environment in contributing to the minimization and control of nosocomial infections is still too often considered a minor factor among others that impact the hospital-acquired infections rates. This happens regardless of the availability of a strong and growing scientific evidence which supports the importance of environmental factors in the transmission of MRSOs.

Other factors, such as the adherence of medical staff to hygiene protocols and the vulnerability of the patients treated are thought to have a higher impact.

The differences of emphasis given to one factor rather than another is normally linked to the health care culture and the policy adopted. This might be due to the way operating procedures and teams are set up in different countries. The differences in planning surgical departments in the Netherlands and the Nordic countries are a clear proof of that.

This article has exposed some of the most common architectural measures used to contribute to hospital infection control in hospital wards, operating theatres and intensive care units.

More space for hospital beds, the choice of single bedrooms, the availability and position of hand washing facilities, HVAC systems and air lock solutions, and proper materials seem to be the most common, but not exhaustive, solutions implemented to impact on the control of nosocomial infections. However, relevant layout arrangements are also considered to be highly important in preventing the spread of MRSOs.

Differences between countries, beliefs and lack of scientific evidence in linking the built environment to the control of nosocomial infections, offer the possibility of exploring new frontiers in hospital design and management.

There is a need and a challenge to set-up further and systematic investigations aimed at strengthening the role of the physical environment in the minimization and prevention of hospital-acquired infections. ❑

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How can emerging disinfection technologies gain a foothold in the current culture of hospitals?

DAVID ST CLAIR
EXECUTIVE CHAIRMAN, SANOSIL INTERNATIONAL LLC

ABSTRACT: In the United States, more than 90% of hospitals still use only the traditional "spray and wipe" disinfection methods initiated over a century ago to protect patients from their environment; international adoption of new methods is even lower. Innovative approaches like whole room disinfection find an inhospitable reception in spite of clearly superior reductions in health care-acquired infections. Much of the resistance is due to a lack of true accountability for patient safety in hospital organizations and to perverse incentive structures in historical reimbursement policies. But all of that may change in the coming years as hospitals and doctors become more responsible for the health outcomes of their patients.

For well over a century, hospitals around the world have fought against the rise of what are now called "health care-acquired infections" (HAIs) caused by a long list of pathogens like *Clostridium difficile* and *Staphylococcus aureus*. Patients entered the hospital and quickly became exposed to disease and infections unrelated to their admitting diagnosis. In recent times, the increased resistance of bacteria like MRSA to standard antibiotics has only complicated the fight against HAIs as patients without a history of heavy antibiotic use are infected by bacteria already hardened by mutagenic processes in other patients. Today, as many as 1 in 20 – or a total of 1.7 million hospitalized patients annually – will contract an HAI in United States hospitals; of those cases, approximately 5% will die *(1)*. Approximately 300,000 *Clostridium difficile* infections (CDIs) occur in the United States each year and they are becoming increasingly resistant to standard treatments *(2)*.

The battle against pathogenic infections has multiple fronts. One focus, instrument and device sterilization, copes with the potential introduction of pathogens into a patient by the application of heat, UV or harsh chemicals to the devices and instruments. All such processes require a very controlled environment in which to act on the instruments and devices. While there have certainly been advances in sterilization technologies, the most common methods – like the use of autoclaves for surgical instruments – have been around since the 19th century.

The second front has been the advances in treatment of patients already infected with the pathogens. The incredible strides made through the development of increasingly sophisticated antibiotics, for instance, saved – and continue to save – countless lives each year in developed and developing countries worldwide. However, as mentioned, the overuse of these miracle drugs and evolutionary processes have created strains of drug-resistant pathogens and, most alarmingly, some can now pass that resistance on to other types of pathogens. The concurrent lack of a viable drug development pipeline for new antibiotics diminishes the health care system's ability to protect patients from the ravages of infections already contracted. These circumstances elevate the importance of an effective prevention strategy to a higher level than ever before.

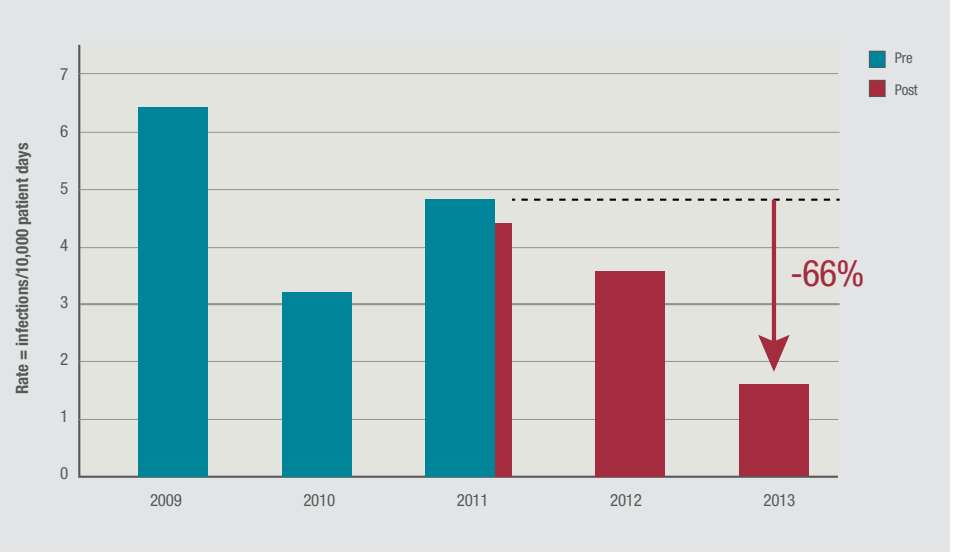
The third area, therefore, has been to try to ensure that vulnerable patients are never exposed to the most virulent pathogens found in health care settings. Those efforts can be easily categorized into hand sanitization and environment disinfection. About 150 years ago, studies in Vienna by Dr Ignaz Semmelweis and in Boston by Dr Oliver Wendell Holmes Sr established that hospital-acquired diseases were often transmitted via the hands of doctors and nurses. Since that time, much has been written and done to try to limit the exposure of one patient to pathogens brought into their room by staff coming from another patient's bedside. Refinements in scrubbing techniques have emerged, as have new chemicals (mainly alcohol-based gels). In spite of the combination of good intentions, excellent training and implementation of staff motivation policies, hospital staff are still far from perfect in their use of this very basic infection reduction technique. In fact, compliance with hand sanitation policies in the United States, for example, remained effectively below 50% for both intensive care unit (ICU) and non-ICU staff in 2009 *(3)*.

In the face of such odds, how do hospitals keep pathogens from being picked up in one location and carried to another? Environment disinfection is one way to minimize the risk. The vast majority of surface disinfection in hospitals over the past two centuries has been attempted by using the process widely known as "spray and wipe". The notion of disinfecting an entire room was reduced to trying to routinely disinfect the primary surfaces in the room. In recent years, the focus of the disinfection process was even further diminished to what came to be identified as "high-touch surfaces". In reality, despite attempts to implement a standardization of training and cleaning techniques, the overall thoroughness of cleaning designated high touch surfaces ranges widely. And a study shows no significant correlation between the thoroughness of cleaning high-touch surfaces and the amount of time required to clean the room, with an average time to clean a

standard hospital patient room being 30 minutes *(4)*. It seems clear that just doing more cleaning will not reduce HAIs in significant ways.

The ancient Greeks, who apparently understood that pathogens live throughout a room and not just on high-touch surfaces, are reported to have fumigated their houses by burning sulfur to create sulfur dioxide gas. Why, then, do modern health care executives fail to grasp that to effectively kill disease-causing pathogens – and thereby lower HAI rates – all surfaces in an entire room must be treated? *C. difficile* spores, for instance, are found both in the air and on surface environments around infected patients 60% of the time *(5)*. The concept of "whole-room surface disinfection" must replace methods that are best suited only for disinfecting small and discrete surfaces like table tops and bed rails.

FIGURE 1: *C. DIFFICILE* INFECTION RATES, PRE- AND POST-IMPLENTATION PERIODS



There are new technologies for whole-room disinfection in use in the United States, but their market penetration remains quite low. The most prevalent – largely because it is unregulated by either the FDA or the EPA (as are all other disinfection technologies) – is the use of ultraviolet light to destroy pathogens. While some manufacturers of UV light dispensing systems claim to kill 99% of bacteria, viruses and spores, it remains very difficult to verify without the rigorous efficacy testing required by the regulatory agencies. It is commonly recognized that to be effective, UV light must encounter a contaminated surface directly to kill pathogens at an effective rate. Should the light be blocked and the surface be in a shadow, a high percentage of the pathogens will survive *(6)*. The complexity of hospital patient, treatment and operating rooms creates very shadowed environments.

Another relatively new and fully regulated technology available to accomplish whole-room disinfection uses hydrogen peroxide-based chemistries. This wholeroom disinfection technique dispenses the H_2O_2 solution using a machine to form either a Hydrogen Peroxide Vapour (HPV) or an aerosol fog that is dispersed throughout the environment, touching all surfaces. Disinfection with these methods of application reduces the labour and skill required and is very effective in reducing the number of infectious organisms in a given room *(6)*. These approaches have been proven to have a 6-log kill on pathogens like *C. difficile* spores, one of the hardest microorganisms to eradicate. While the difference between an assumed 99% kill rate and a proven 99.9999% kill rate might seem small, the former allows 10,000 times more pathogens to survive than the latter!

One of the first HPV systems was developed by Bioquell and uses a hazardous 35% H_2O_2 solution dispensed from a large vaporizer that requires significant operator training. Like the system from Steris, use of the Bioquell HPV system is very effective and has been approved as a sterilizing process. Given their expense and the size of the units, both systems are generally recognized as more appropriate for sterilization of pharmaceutical manufacturing environments than for normal health care facilities.

Pennsylvania Hospital, a 496-bed teaching hospital in Philadelphia, Pennsylvania, began using the Halo Disinfection System in 2011 to reduce their hospital-acquired *C. difficile* rate as demonstrated in Figure 1. This compares favorably to the CDC's recently reported reduction in *C. difficile* infection rates of only 2% nationally for the same time period.

The Halo Disinfection System (HDS) from Sanosil International is an H_2O_2 fogging system that aerosolizes a non-hazardous H_2O_2 solution (5%) containing a small amount of stabilized ionic silver (0.01%). The HDS application process requires little operator training and is a small fraction of the capital cost of either the UV or HPV systems. Yet it achieves the same 99.9999% kill rate against spores.

Given the proven efficacy of the whole-room disinfection systems and the clear failure of traditional spray and wipe disinfection approaches to significantly lower the rate of HAIs, why are the new technologies not being more rapidly adopted? And in an environment where governments and private insurers are beginning to refuse to pay for preventable errors, a category into which many HAIs will fall, how long will it be before hospitals will change their focus? The prevailing sentiment is that hospitals are simply large, complex organizations that are slow to change habits formed over many decades of reinforcement, including full reimbursement for treating infections contracted while in their care. If medical advances in the United States are thought to take 17 years to spread in the physician community, why expect a different result in a hospital?

One key to understanding the problem is the lack of clear accountability for reducing HAIs in hospitals today. While the infection prevention professionals are passionate defenders of patients, their families and hospital staff, they seldom have control over budgets and resources to truly affect outcomes. The physician Head of Infectious Diseases consults with the Infection Prevention Department, but sees patients and has responsibilities well beyond minimizing HAIs. Housekeeping (called environmental services, or EVS, in the United States) has the responsibility for managing the enormous task of maintaining and cleaning a large, complex facility that operates 24 hours a day, 7 days a week utilizing a workforce with generally very high turnover rates. Typically, no individual is given the charter, the budget and the authority to change the way hospitals deal with the full range of processes to improve the safety of their patients.

Consequently, improvement efforts are often made on a piecemeal basis, with each element of an overall plan subject to being attacked by vested interests with more power and more authority. The Marketing Department introduces new, comfortable upholstered chairs into patient rooms – and the *C. difficile* infection rate skyrockets. EVS is given a dictum by the CFO to ensure that all rooms are turned around in under 30 minutes, so patients are exposed to potentially deadly pathogens because insufficient time was allotted for disinfection to keep them safe.

There are legitimate challenges to the use of the new technologies, but these challenges can be mitigated by careful planning. The first is capital cost – HPV and UV systems costs between about US$ 60,000 and US$ 120,000 each. As the only EPA-validated fogging system, the Halo Disinfection System costs well under US$ 10,000. And while the cost of spray and wipe room treatment is initially cheaper, the cost of treating unnecessary infections and patient deaths resulting from incomplete disinfection is far more expensive. True – patient room turnaround times are delayed by UV treatment, and indeed extended even further for a complete HPV or fogging intervention. But by focusing on isolation rooms and on rooms where infectious patients have been treated, the average turnaround time for rooms need not increase by much. And is it worth an extra hour to truly protect the staff and the next patient to be in that room?

Whole-room disinfection systems and processes consume resources, but they reduce the costs of treating patients with HAIs by a far greater amount. Pennsylvania Hospital, for example, saved about US$ 10 for every US$ 1 they spent on the Halo Disinfection System – and, in 2013, about three patients who might have died of complications from hospital-acquired *C. difficile* never even caught the disease.

Accountability is key – someone needs to be provided the resources and the authority to be directly accountable for patient safety in hospitals. In too many hospitals, that is simply not the case today. ❑

David St Clair is a successful entrepreneur who has founded or invested in a number of companies seeking to transform services and information technology in the health care market over the past 30 years. In every instance these companies focused on improving the quality of care while reducing the cost of that care. His interest in Sanosil International was sparked by the company's ability to dramatically reduce the incidence of hospital-acquired infections at a remarkably low cost.

Mr St Clair was raised in the Caribbean, received his Bachelor of Applied Science from the University of Pennsylvania and an MBA from the Harvard Graduate School of Business.

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Nosocomial infections: Aligning strategy and action from mission to outcomes

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ABSTRACT: Outstanding health care institutions around the world lead, in effect, by setting an example and keeping hospital-acquired infections to a minimum. Behind the apparent simplicity of an indicator hides an enormous complexity. We believe that the difficulty in achieving seemingly simple benchmarks stems from the necessity to perform optimally at different levels of the organization consistently. This challenge can be summarized in a word: alignment. Institutional alignment starts with the mission and must be ubiquitous. Achieving the benchmark illustrates the elusive trait of institutional coherence. We will describe the dimensions and levels at our institution that influence our ability to strive for better indicators in the prevention of nosocomial infections, examine some of the difficulties and provide a few examples of success.

Health care-related infections are, to a large extent, preventable adverse events affecting about 4% of hospitalized patients. Magill et al., found the most common infections were pneumonia (21.8%), surgical-site infections (21.8%) and gastrointestinal infections (17.1%). Device-associated infections accounted for 25.6% of such infections *(1)*.

Box 1: Fundación Santa Fe de Bogotá

A private,non-for-profit organization, the Fundación Santa Fe de Bogotá is committed to contributing to health improvement in Colombia and the region through its work in health care, health education and public health. Innovating, improving and securing higher value for patients, communities and society as a whole is its core objective.

The burden of endemic health care-associated infections in developing countries is much higher. In a meta-analysis by Allegranzi et al, the prevalence of health care-associated infection was 15.5 per 100 patients (95% CI 12.6–18.9), much higher than proportions reported from Europe and the United States. Pooled overall health care-associated infection density in adult intensive care units was 47.9 per 1000 patient-days (95% CI 36·7–59·1), at least three times as high as densities reported from the United States. Surgical-site infection was the leading infection in hospitals (pooled cumulative incidence 5.6 per 100 surgical procedures), strikingly higher than proportions recorded in developed countries *(2)*.

Outstanding health care institutions around the world lead, in effect, by setting an example and keeping hospital acquired infections to a minimum. This minimum is the benchmark. Below this threshold, the preventable adverse effects become unpreventable, with current knowledge. This benchmark represents the state of the art, to be challenged only by those who have achieved consistency in the execution of all optimized interventions to be able to innovate *(3)*.

Emulating benchmarks, such as the lowest possible incidence of ventilator-associated pneumonia, catheter-associated urinary tract infection or central catheter-associated bloodstream infection, is the dream of health care teams in hospitals around the world that aim to serve their patients well. Despite the existence of a very high concentration of talented individuals with a clear motivation to serve, only a small percentage of hospitals achieve the benchmarks that characterize exceptional health care. The devil is in the detail.

Behind the apparent simplicity of an indicator such as adherence to hand hygiene, hides an enormous complexity. We believe the difficulty in achieving seemingly simple benchmarks stems from the necessity of performing optimally at different levels of the organization in a systematic and consistent way. This challenge can be summarized in a word: alignment *(4)*.

Institutional alignment starts with the mission and must be ubiquitous. Achieving the benchmark illustrates the elusive trait of institutional coherence. We will describe the dimensions and levels

in our institution that influence our ability to strive for better indicators in the prevention of nosocomial infections, and examine some of our difficulties and provide a few examples of success.

Box 2: The core features of alignment

- Mission and purpose
- Strategic planning
- Transformational (collective) leadership

Mission and strategic planning

Preventable hospital-acquired infections are the result of unsafe health care practices. The relevance of this concept is best demonstrated by its incorporation in the national safety goals of the Joint Commission (National Safety Goals JCI, 2014). Consequently, the commitment to patient safety must be explicit in the strategic planning of the institution. Our value health care proposition at Fundación Santa Fe de Bogotá is "to deliver efficacious and safe medical care". Having safety at the forefront of our value proposition enables our focus to be on infection prevention (www.fsfb.org.co). In congruence with the value proposition, our institutional leadership is characterized by their commitment to efficacy and safety.

Transformational leadership

Outcomes focus the leadership on interventions that will impact on the quality of health care. Targeting outcomes provides stronger direction for the leadership: it is clear where to aim. Therefore, driving fundamental transformations in the organization that will enable radically different achievements by the institution are one of the roles of contemporary leadership. Some of the components of this transformational role are identifying the need to change, advancing strategic planning, driving cultural transformation, developing customized human resource, appropriating the methodology required for institutional innovation and the relentless pursuit of alignment *(5)*.

In the chapter, "No excuses: Effective leadership to achieve the triple aim", Bisognano and Kenney summarize the role of the contemporary executive leadership using Tom Nolan´s definition: "Building will, generating or finding better ideas and models and engaging in impeccable execution" *(6)*.

Our leadership has aligned all its resources to drive a master plan to achieve better efficacy and safety in the care we deliver. We abide voluntarily and simultaneously to the standards provided by the Colombian national accreditation process (ICONTEC-ISQua), Galardón Hospital Seguro, a national competition that focuses exclusively on safety run by the Asociación Colombiana de Hospitales y Clínicas, and those of Joint Commission International. For the development of programmes with outstanding clinical performance, we use the Joint Commission Standards for Clinical Care Programs. All of these sets of standards address the prevention of hospital-acquired infections (Table 1).

Box 3: Getting started

- Evidence-based policies
- Measurements
- Implementation
- Observable exceptions (and positive deviances)
- Continuous improvement

Evidence-based policy

A vocation towards central coordination of initiatives, like infection prevention, is lacking in the culture of most hospitals. More frequently, one finds a heterogeneous group of practices, with different indications for interventions as well as different thresholds for their application. The coexistence of numerous subcultures within one roof is typical. Surprisingly, contemporary efforts to homogenize care and monitor outcomes are a recent introduction to the hospital environment *(7)*. Often this initiative is perceived by medical staff as a breach of their professional autonomy, a sensitive subject. Consequently, the development of a clinical culture of decisions based on evidence is, perhaps, the most important tool to drive convergence. Selection of interventions that are rigorously connected with the desired outcome should be the basis for the construction of institutional policy for the prevention of hospital-acquired infections. In the structure of the policy, mission, strategic planning, the best evidence and practices must converge in a call to action for nosocomial infection prevention.

In an ever improving process, our Infection Prevention and Control Committee assembles our institutional policy for the prevention of infection and creates the indicators to measure adherence to the process and outcomes. Policy and indicators are published in real time on our institutional intranet and are available to all staff. It is the role of the committee to achieve homogeneity of practice and outcomes across the

Table 1: The institutional global health care-related infection index reflects a combination of efforts and interventions to decrease the incidence of infections. The threshold proposed by the local authority, Secretaría de Salud de Bogotá is 4%. We work towards a more stringent threshold of 1.5%, benchmarking with international high performers

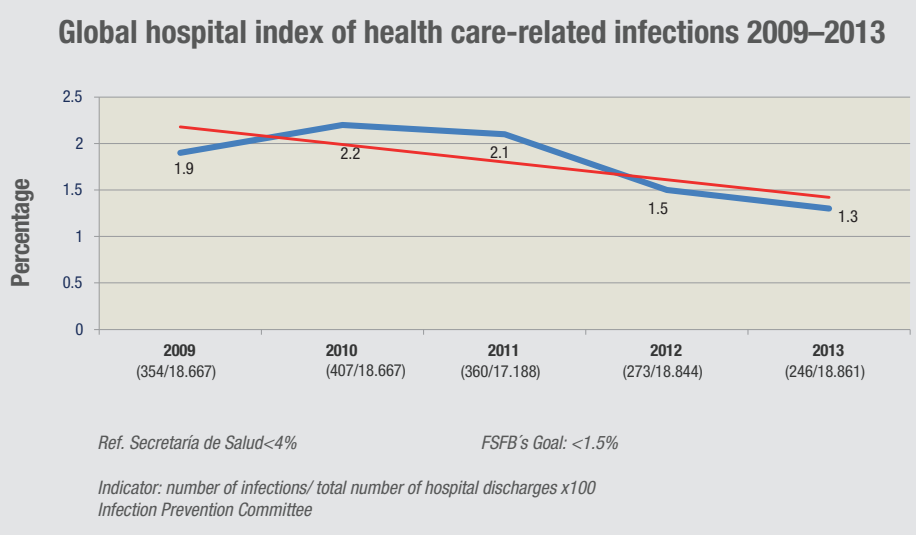


Table 2: The impact of interventions on fairly simple hospital-wide procedures like placement, care and prompt removal of a vesical catheter reflect the cultural penetration of the policy. In order to improve on the incidence of vesical catheter-related infections, an institutional policy based on the best available evidence was created by members of all relevant clinical areas and professions of our staff, and implemented during 2013 using six-sigma methodology *(16)*

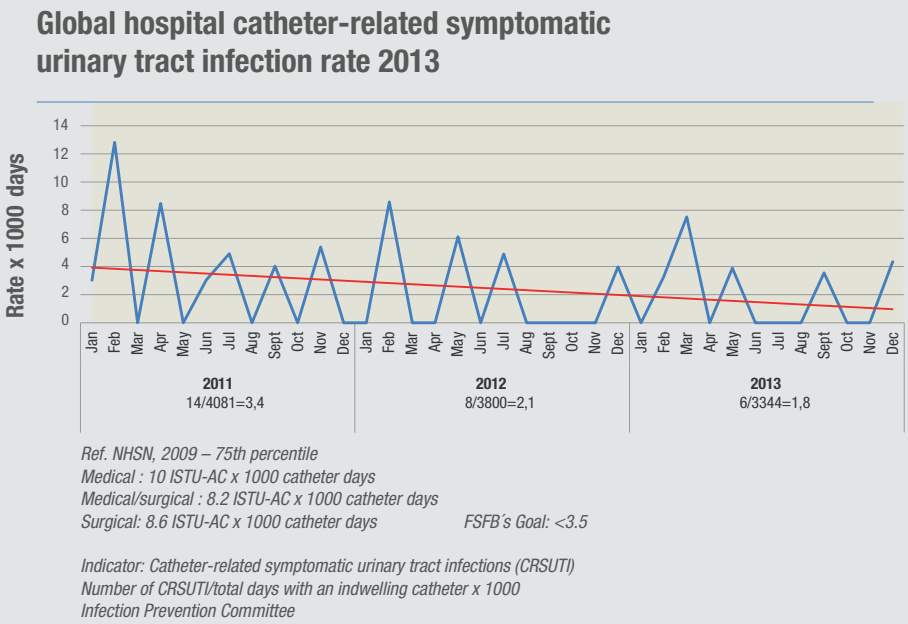
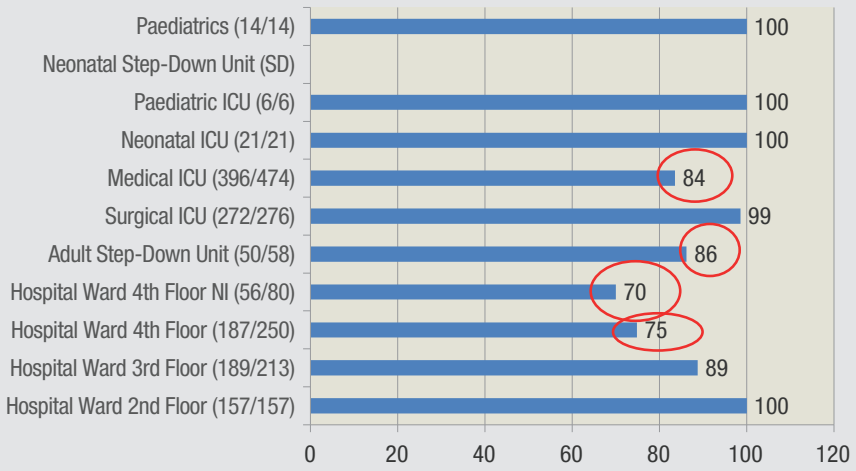


Table 3: The suboptimal outcomes circled in red suggest uneven penetration of policy. Having objective measures provides clarity as to the areas where intervention is required. A root case analysis typically reveals a multifactorial problem. Surprisingly, explanations for the same problem may vary in different areas of the institution



institution (Table 2).

Measurement: Establishing the baseline

The lack of initiative to measure the outcomes of clinical processes is often the start of the conversation between management and health care workers, and it is predictably, the end of it as well. Health care workers are typically driven, independent thinkers who went into health care to serve. Serving well is their primary motivation. Consequently, they respond to objective measures which demonstrate that, contrary to their perception, they are not serving well.

Providing baseline data that reflects suboptimal outcomes is paramount to starting health care workers on the right pathway towards creating a solution that will address inadequate outcomes in infection prevention. Additionally, one must provide resources and tools along with measurements and recognition of improvement.

The underlying purpose of measurement is to align leadership and staff behaviour so that it cascades through the organization to drive results. The better the organization can align these behaviours, the more quickly it will achieve the desired results and create opportunities to recognize staff. Recognized behaviour gets repeated which makes the cultural flywheel turn faster *(8)*, (Table 3).

Implementation

Even if everyone agrees, making things happen in a hospital is still a formidable challenge. The science of implementation research and delivery provides clarity, and badly needed relief, as to why the seemingly obvious will not materialize and how to solve the problem. Implementation research addresses the questions concerning the act of carrying an intention into effect. Context plays a key role in implementation research. It is especially concerned with the users of the research or process and not purely with the production of knowledge *(9)*. It is also defined by Curran et al., as a method to enhance the adoption of a clinical intervention, for example, a policy on how to prevent nosocomial infections *(10)*.

A change in context and culture has resulted from an increase in the mix of full-time physicians who work at our institution, as well as by having them write and implement a policy that defines the way we care for our patients (Política Asistencial) ie Table 4.

Observable exceptions: Positive deviance

As a problem-solving process, this approach requires retraining ourselves to pay attention differently, awakening minds accustomed to overlooking outliers and cultivating scepticism about the inevitable. The concept is simple: look for outliers who succeeded against all odds. A fundamental premise of positive deviance is that under the most impossible of circumstances, usually, someone has figure out a way to cope. The solution is hidden, or better, unrecognized within the institution *(11, 12)*, (Table 5).

Continuous improvement

Measurement is necessary, but not sufficient for quality. The link between measurement and improvement is critical for insuring an appropriate system design improvement *(13)*. As stated by Berwick, "To make improvements we must be clear about what we are trying to accomplish, how we will know that a change has led to improvement, and what change we can make that will result in an improvement: The more specific the aim, the more likely the improvement" *(14)*.

The continuous exposure of the challenge of improvement when confronted with an objectively documented quality gap will produce one of the most valuable transformations in a health care institution: the ability to re-learn. As predicted by Alvin Toffler, the ability to learn, unlearn and re-learn has become relevant. It is central to continuous improvement in health care, and especially important in tackling complex problems at a time of rapid change in scientific knowledge.

Capacity building

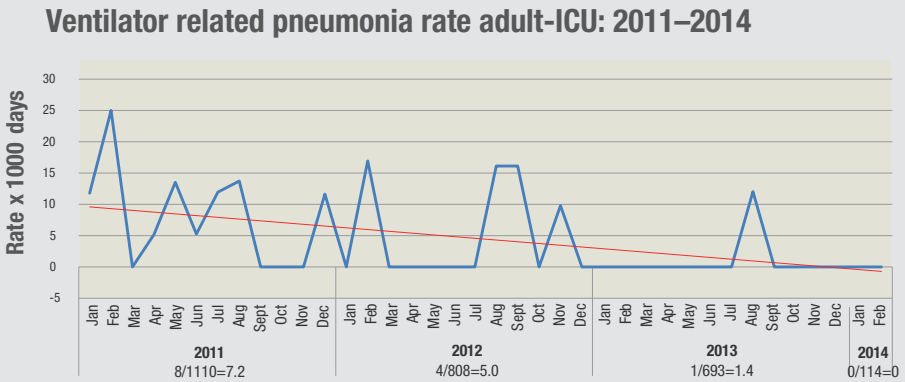
Some of the elements which are indispensable for success at health care systems level are equally important within the smaller scale of a hospital. This is the case with capacity building (A promise to Learn, a Commitment to Act, NHS, 2013). Ownership of the process of continuous improvement by all whose behaviour or practices might need to change is a vital part of driving the construction of solutions.

The result of the combination of actions and interventions that we have described is cultural transformation, with a strong sense of ownership and pride. The product is a new professional, a new group of professionals, and if one reaches the tipping point of cultural transformation, a new institution: one that has appropriated learning, unlearning and re-learning, a new capacity *(15)*.

Outcomes

Emulating outcome benchmarks is the dream of the health care teams of hospitals around the world that aim to serve their patients well. To be successful in achieving this relevant clinical goal and to

Table 4: With alignment and cultural appropriation, implementation is possible. Under these conditions even allegedly impossible outcomes are possible



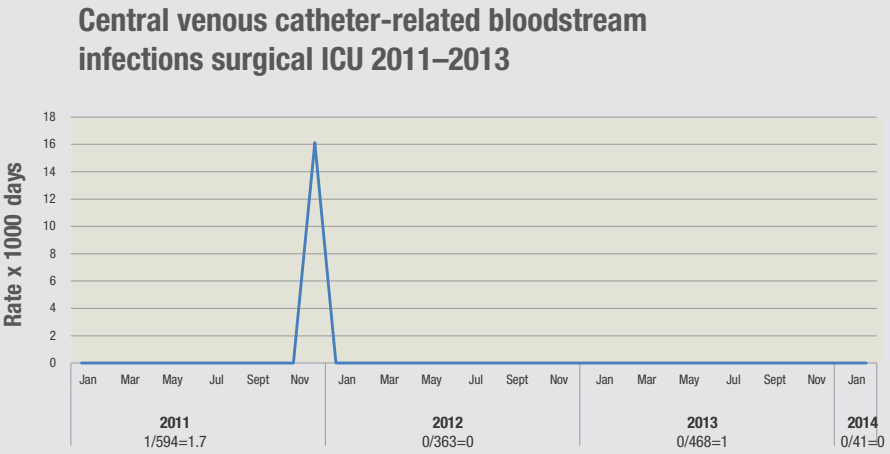
Ref. NHSN, 2009 – 75th percentile

Medical major teaching: 4.2 pneumonia x 1000 ventilator days

Medical/surgical major teaching: 3.1 pneumonia x 1000 ventilator days *FSFB's Goal: 0*

Indicator: Number of pneumonias/total number of ventilator days x1000
Infection Prevention Committee

Table 5: TThe results in prevention of CVC-related blood stream infections within the subculture of the surgical ICU exceed international benchmarks, despite a patient mix with a high risk of complications. Their outstanding results present a unique opportunity to study their subculture and processes in order to replicate their results throughout the institution



Ref. NHSN, 2009 – 75th percentile

Medical major teaching: 3.7 ITS–AC x 1000 catheter days

Medical/surgical major teaching: 2.9 ITS–AC x 1000 catheter days *FSFB's Goal: 0*

Indicator: ITS–AC

Number of CVC–related blood-stream infections/Total CVC days x 1000

Committee for the prevention of infections

Box 4: The (sustainable) results!

- Capacity building
- Superior outcomes
- Aligned culture

be able to embark in this fascinating intellectual and social science challenge, alignment of action and values is a prerequisite. The suboptimal outcome is only the visible part of the challenge. Without profound institutional soul searching, valid technical solutions may pass without impact through a resistant social system like neutrons through a concrete building *(15)*. ❑

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Dr Prada started his career in infectious diseases at the Fundación Santa Fé de Bogotá in 1983. He has devoted his time and research to health care-related infections, HIV and Critical Care medicine. In the early 1980s he created the first Infection Control Committee in the country. Dr Prada also founded the Colombian Association of Infectious Diseases, has been past President of the Pan sAmerican Association of Infectious Diseases and Fellow and member of the Foreign Affairs Committee of the Infectious Disease Society of America. Dr Prada has published more than 80 papers in peer reviewed journals and book chapters as well as more than 50 abstracts.

Professor Henry Gallardo obtained his MD degree from Pontificia Universidad Javeriana in 1991, with further specializations from the same university in hospital management (1993) and health care administration with an emphasis on social security systems (1994). Since March 2013, he has been University Hospital Director at the Fundación Santa Fe de Bogotá (FSFB). Before this position, he was Corporate Business Director from 2006. In parallel he served as member of various Boards of Directors in private companies and was a member of the editorial committee of journal Hospitalaria*. Before FSFB, for five years he worked for Johnson & Johnson Medical Devices & Diagnostics as Health Economics and Reimbursement Director for Latin America. From 1996 to 2001 he was the Healthcare Department Director at Fundación Corona, and before this period he was responsible of different projects at the Colombian Ministry of Health. In 2001 and 2002 he served as a World Bank short term consultant. From 1993 to present, he has been Professor of Healthcare Systems at different universities and has published on topics related to the Colombian health care sector and its reform.*

Dr Juan Pablo Uribe is a medical doctor by training and Director-General of the Fundación Santa Fe de Bogotá. Previously, he was the World Bank s Health Sector Manager for East Asia and the Pacific, based in Washington D.C. With master degrees in public health (with an emphasis on health policy and administration) and in public administration from the University of Michigan, he has held various positions in the public and private sectors, nationally and internationally. He is a former Vice Minister of Health for Colombia (1998–1999) and former National Director of Public Health (1994). He was also CEO of the Fundación Santa Fe de Bogota (2005-2009) and senior health specialist for the World Bank in Latin America (2000–2004). Currently, he is a board member (and Vice President) of the Colombian Association of Hospitals and Clinics and the National Board of Health Accreditation, among others, and a member of the Panel of Experts of the Global Program on Output-Based Aid (GPOBA) at the World Bank.

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The urgent need for infection control programmes in Indian health care

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ABSTRACT: The emergence of "superbugs" like carbapenem resistant Enterobactericiae with a NDM1 resistance pattern is a serious situation in clinical facilities in present times.[i] The risk of health care-associated infections (HCAI) in emerging countries is two to 20 times higher than in developed countries; in some countries, the proportion can exceed 25% *(1)*. Hospital infection prevention and control is fundamental to improving care, reducing the emergence of multidrug-resistant organisms and ensuring safety. In India constant efforts are taking place in this direction. The Clinical Infectious Diseases Society of India, along with other clinical societies, has come up with the Chennai Declaration in 2012. This has been adopted by Indian Government Health Departments and necessary steps for curtailing indiscriminate antibiotic use have also been taken. Also, it is extending the concept of antimicrobial stewardship to the community. Some novel ideas tried at Columbia Asia Hospitals in India to improve hospital infection control programmes are shared in this article.

New Delhi Metallo-b lactamase (NDM-1) in Enterobacteriaceae: Treatment options with carbapenems compromised."[i] This published article has made a shocking revelation about the terrifying truth currently lurking in medical community in India. Resistance to carbapenems is of great concern as carbapenems are considered to be antibiotics of the last resort to combat infections by multidrug-resistant bacteria, especially in intensive care units (ICU) and high risk wards. While carbapenem resistance in Pseudomonas and Acinetobacter spp is well known, resistance among Enterobacteriaceae is increasing. Carbapenem resistance in Enterobacteriaceae has increased from nothing in 2006 to 8% in January to August 2009 in ICU blood cultures. This is worrying as a novel New Delhi-1 (NDM-1) enzyme was reported in a national alert in United Kingdom. NDM-1 was strongly linked to India and Pakistan and many of the United Kingdom cases had recent medical exposure in the Indian subcontinent. The NDM-1 enzyme has been accumulating swiftly probably due to efficient plasmid transfer. In the United Kingdom report, the NDM-1 producing isolates were clonally diverse, indicating parallel evolution of resistance, doubtlessly under antibiotic pressure. This calls for curtailing indiscriminate antibiotic use. The concept of antimicrobial stewardship should be extended even to the community. Antimicrobials should be chosen carefully in every clinical situation. It is for this very reason that this group had studied and reported the outcome of treating infections due to ESBL (Extended Spectrum Beta Lactamases) producing organisms with non-carbapenem antimicrobials. The identification of NDM-1 in 22 of 24 isolates is a very worrying development. NDM-1 being present among Enterobacteriaceae has the potential for further dissemination in the community. Such dissemination may endanger patients undergoing major treatment at centres in India and this may have adverse implications for medical tourism. Besides stringent infection control in hospitals, good sanitation in the community is also needed to contain the spread of such clones.[i]

It is unfortunately true that India has lagged behind other developed countries, in her efforts to rationalize antibiotic usage. The important contributing factors to the high antimicrobial resistance rate in India are:

- the heavy burden of tropical diseases;
- heterogeneity in the standard of health care institutions;
- a large population;
- socioeconomic disparity;
- sanitation issues in many parts of the country;
- inadequate awareness about the antibiotics resistance issue;
- inadequate training on rational antibiotic usage in the undergraduate and post-graduate curriculum;
- the extreme laboratory orientation of the microbiology curriculum;
- lack of a nationwide antibiotic resistance surveillance network;
- inadequate infection control facilities in many hospitals.

There were no organized efforts to tackle the resistance problem until the roadmap meeting of medical societies and the Chennai declaration of August 2012.[ii]

At any time, over 1.4 million people worldwide suffer from HCAI. About 5–10% of patients admitted to modern hospitals in the developed world acquire one or more infections[1]. The risk of HCAI in developing countries is two to 20 times higher than in developed countries; in some countries, the proportion can exceed 25% *(1)*.

[i] New Delhi Metallo-b lactamase (NDM-1) in Enterobacteriaceae: Treatment options with Carbapenems Compromised" P Deshpande, C Rodriguez et al published in Journal of Asso. of Phy. of India, March 2010'

[ii] Ghafur A, Mathai D, Muruganathan A, Jayalal JA, Kant R, Chaudhary D, et al. The Chennai declaration: A roadmap to tackle the challenge of antimicrobial resistance. Indian J Cancer 2013;50:71-3. Available from: www.indianjcancer.com/preprintarticle.asp?id=104065 [Last accessed date on 2013 Dec 13].

A survey conducted in 12 ICUs in seven hospitals across seven Indian cities found 87.5% of all S. aureus HCAIs were caused by meticillin-resistant (MRSA) strains, and 71.4% of Enterobacteriaceae were multiresistant; the study concluded that HCAI rates, length of stay, mortality and bacterial resistance were high and infection control programmes including surveillance and antibiotic policies are a priority in India *(2)*.

The proportion of HCAI cases potentially preventable under routine working conditions is significant. The 1985 landmark SENIC study *(3)* showed that with intensive infection control and surveillance programmes, an overall reduction of 32% in HCAI rates could be obtained in a 5-year period. A more recent review found a minimum reduction effect of 10% to a maximum of 70%, depending on the setting, study design, baseline infection rates and type of infection *(4)*.

In 2004, WHO launched the World Alliance for Patient Safety in response to a World Health Assembly resolution (2002) urging the WHO and Member States to pay the closest possible attention to the problem of patient safety. The Global Patient Safety Challenge is a core programme of the World Alliance for Patient Safety aimed at drawing attention to patient safety. The first campaign launched in 2005–2006 brings together the WHO Guidelines on Hand Hygiene in Healthcare with ongoing work on blood safety, injection and immunization safety, safer clinical practices, safe water, sanitation and health care waste management. The core message of that campaign was: "Simple measures save lives" which focused on preventing HCAI by simple interventions like hand hygiene *(5)*. The second challenge, "Safe surgery saves lives," was launched in 2008. The third challenge, launched in 2010, focused on the unprecedented spread of drug-resistant pathogens and the implications for patient safety. Over 120 WHO Member States have now signed a national pledge to tackle HCAI including India *(6)*.

Over the last few years, the rate that HCAIs have emerged has become one of the leading markers of the quality of clinical care and patient safety. Infection control underpins safe and sound clinical practice and requires attention to certain details, the responsibility for which lies with every health care practitioner. However, it is the role of a good management to raise awareness of the problem and make individuals and teams own up to responsibility. Lack of awareness is a direct consequence of lack of measurement i.e., unavailability of surveillance data on HCAIs at local level. Although surgical site infections, urinary tract infections, hospital acquired pneumonia including ventilator associated pneumonia and intravenous device associated infections are of common occurrence, often with serious consequences contributing to mortality and morbidity, clinicians accept these consequences as inevitable part of clinical practice. Lack of an institutional framework or programme to deal with such avoidable risks perpetuates the culture of acceptance of HCAIs as inevitable consequences.

Health care-associated infection: A marker of clinical care quality

Infection control and prevention is fundamental to improving care and ensuring safety. A safer clinical care environment and adherence to certain basic principles already addresses many issues related to infection control. However, recent experiences in the developed countries show that it is possible to lower the HCAI rate only when infection control is accepted as a core corporate and individual responsibility by both the management and clinical staff facilitated by an infection control team (ICT) under a formal institutional programme. The ICT is a source of expert knowledge and help, but the responsibility must lie with the clinical team. It is also a requirement that effort to combat HCAIs are whole-heartedly backed by the management and made a priority and a core standard to be achieved *(8,9)*. In England, safeguarding patients and staff from the risk of avoidable HCAIs has recently been made a statutory responsibility of the hospital management *(10)*.

Driving changes to combat health care-associated infection

Driving changes and making improvement in a complex organization such as a hospital is a challenging task, particularly when it comes to a problem like HCAIs where a change in attitude and behaviour by all concerned are critical in dictating success or failure. Innovation and improvement investment in infrastructure and equipment is necessary, but there is also a need for continuous effort to make incremental improvements to the services within the available resources and constraints. Reducing the incidence of HCAIs is considered an integral part of patient safety and quality of care. As such, the hospital needs to embark on a planned quality improvement programme that incorporates reducing HCAIs as priority.

Improvement methods

Any improvement process is driven by a team led by effective leadership, with a commitment of adequate resources and attention by the management. The Model for Improvement is a simple yet powerful tool for accelerating improvement. This model has been used very successfully at Columbia Asia Hospitals in India, and is like those used by health care organizations in many developed countries, with some unique interventions to suit local conditions.

The model has two parts:

- Three fundamental questions (which can be addressed in any order):

1. What we are trying to accomplish? To reduce the incidence of surgical site infections (SSI), central line-associated blood stream infections (CLBSI), ventilator-associated pneumonia (VAP) and Catheter-associated urinary tract infections (CA UTI), by a defined percentage in a defined period in our hospitals.

A time-specific and measurable aim has been put forward by our management to reduce the four important HAIs within six months at particular units of our organization who were lagging behind .The local team leaders were motivated and given the task.

2. How will we know a change is an improvement? The team at Columbia Asia, uses WHO and CDC cut offs for HAI rates. We aim to keep the rates below the established standards. The ultimate aim is to achieve zero HAIs across all our units.

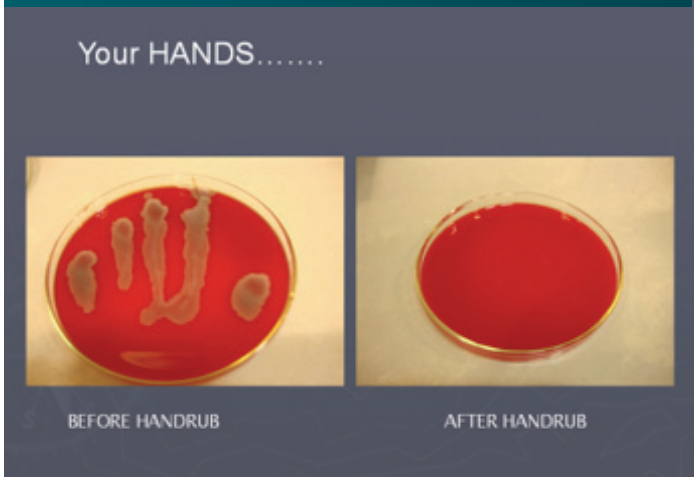
Every Columbia Asia hospital applies for NABH accreditation or "Safe-I" accreditation by NABH, which is the highest body set up in India to ensure the implementation of best Infection prevention and control practices. Getting a third party auditor's accreditation is a positive step towards our efforts against HAIs.

3. Which of the changes we made resulted in improvement?

a) Each unit has a hospital infection prevention and control

committee co-ordinated by the Chief of Medical Services, an infection control doctor and nurse to ensure the implementation of best practices.
b) Every new staff member, be they a doctor, nurse or a technician undergoes training and induction about infection control practices at the time of joining the organization.
c) We have made pocket-sized laminated prints compiling the basics of hospital infection control in a key-chain form. These have been distributed to all doctors across all our hospitals. These are carried by doctors and read and has changed the way they think of HAIs. They have started taking the necessary steps to reduce them, which has reduced irrational use of antibiotics and pre-procedural antibiotic prophylaxis. It also has improved overall hand washing rates.
d) As shown in the picture below, every desktop in the hospital has been uploaded with a picture of two petri-dishes showing the germs growing on an unwashed hand and another, with no germ growth, on a properly washed hand. This reminds the user of the concept of hand washing, every time he/she opens the computer.

Figure 1: Hand washing screen saver



e) Started a hand hygiene campaign focusing on the "5 moments for hand hygiene" approach which defines the key moments when health care workers should perform hand hygiene. It is designed to be easy to learn, logical and applicable in a wide range of settings. Alcohol-based hand-rub is effective for this purpose.
f) Adoption the Surgical safety checklist recommended by WHO.
g) Implemented a local central venous access care bundle for ICU/ITU.
h) Following the safe injection protocols.
i) Implemented a local SSI prevention care bundle.
j) Established an antibiotic stewardship programme. Every clinician has to justify in writing the need to start or change to a higher class of antibiotics like Beta Lactam+ Beta Lactam Inhibitors, carbapenems, Teicoplanin, etc. Also, it is mandatory to send for testing appropriate body fluid/tissue cultures before starting any injectable antibiotic. They have to follow microbiological data and try to de-escalate at the earliest opportunity to do so.

We carried out:

- Targeted outcome surveillance: Carried out at baseline and then at intervals for the project period to establish the scale of the targeted problem (e.g., surgical site infection rate) and then to check periodically to see if the infection control measures put in place are reducing the rate and, if not, exploring why and how to address the situation.
- Process surveillance (or clinical audit): The aim of process surveillance or clinical audit is to observe/ monitor compliance with infection control practices against a set standard by the clinical staff. This process is continued with remedial measures instituted in real time as and when necessary until the practice meets the recommended standard.

Summary

Experience from our own hospitals suggests that HCAI control programme performs best if the frontline clinical staff own the responsibility with the ICT providing expert support by acting as facilitator. It is not a matter of cost but lack of awareness and recognition of HCAIs as a major risk that puts patients' lives at risk which is unacceptable. The scientific, technical and educational resources and examples of successes elsewhere are available to emulate with necessary innovation and variation to meet the local challenge. Increasing public awareness will inevitably lead to the enactment of new legal framework requiring hospitals to prevent HCAIs as a matter of legal responsibility in India, in a similar way to country like England. With increasing awareness, victims of HCAIs are likely to increasingly resort to existing legal remedies such as the Consumer Protection Act.

All major medical societies, representatives of governmental and semi-governmental bodies such as the Drugs Controller General of India Office, National Accreditation Board of Hospitals, Indian Council of Medical Research, Medical Council of India and World Health Organization have endorsed the Chennai Declaration. The declaration provided a practical and implementable strategy to tackle the challenge of antimicrobial resistance in India, giving due consideration to Indian background. Since the publication of the declaration in December 2012, more than a dozen highly reputed international journals have written reviews of the document. This is a significant achievement in academic medical field. As a result of Chennai Declaration efforts, the medical community and Indian authorities have become more receptive about the resistance problem. They have foregone their inhibitions and are open to discussion. The international academic community has changed the approach towards India and other developing countries by being sympathetic and not critical. In the annual report, Chief Medical Officer of the United Kingdom advised the British Government to support Chennai Declaration initiative and for it to be implemented in all commonwealth countries. Reputable colleges and societies such as Royal College of Physicians of Edinburgh, European Society of Clinical Microbiology and Infectious Diseases and the Australian Infectious Diseases Society have endorsed or supported the declaration. What makes Chennai Declaration different from other similar documents on the subject is that it is part of a major initiative to control antibiotic resistance and not just a review document.

A national antibiotics policy will mostly have recommendations and not rules. It will be pubished in the near future. Rationalizing antibiotic use in hospitals by law will be extremely difficult, though hospital accreditation agencies can monitor compliance to the recommendations. The most important step the Health Ministry

undertook was publishing a rule to rationalize the over-the-counter (OTC) sale of antibiotics. Schedule H1, a group of drugs requiring prescription by a registered medical practitioner to be sold OTC, was first published in 2011. All antibiotics were included in this category. This was immediately withheld due to serious political repercussions *(7)*. The roadmap meeting and Chennai Declaration recommendations helped the Ministry to come out of the deadlock by recommending a step-by-step strategy of restricting second and third-line antibiotics to start with. The modified H1 list published by the Ministry has 24 antibiotics and 11 anti-tuberculosis drugs. These drugs will not be dispensed OTC without prescription. Pharmacies will have to retain details of the prescription in a register for three years. The Indian Council of Medical Research has decided to expand the surveillance network by incorporating more hospitals. Let us hope India will have nationwide data on antibiotics resistance in near future. The National Accreditation Board of Hospitals and other accreditation agencies should take initiatives to make sure that hospitals follow declaration recommendations on antibiotics usage and infection control. The Medical Council of India will need to make necessary curriculum changes so as to include structured training on antibiotic usage and infection control at the undergraduate and post-graduate level. An infection control team must be made mandatory in all hospitals. ❑

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He is also responsible for the development of a self-help group for ostomy patients, and was the Vice President of Ostomates, India until 2007. He was the Chairman, Health CII Institute of Quality from 1999–2001 and led a delegation of health professionals to England under the Indo–UK partnership treaty. From 1996 to 1998 he was the Medical Director of Mallya Hospital, Bangalore.

Dr Jairam is trained in colorectal and minimally invasive surgery in United Kingdom and the United States. He attended a course at St Marks Hospital in colorectal surgery in 1986. He studies at Bangalore Medical College, National College, Basavanagudi, and Bishop Cottons School, Bangalore, India. He has been an examiner for MBBS and the MS examinations of several Indian universities and was also an examiner for DNBE in surgery and inspector for the National Board. He has written several papers including publication in the British journal of Surgery.

Dr Maheshkumar M Lakhe trained in internal medicine and has undertaken three years of advanced training in infectious diseases and infection control at the Hinduja National Hospital, Mumbai and CMC, Vellore. He has ten national publications in various high impact journals and at national conferences. He is one of the authors of Chennai Declaration and contributed a chapter on antimicrobials for ENT, dental and ophthalmological infections for the National Antibiotic Policy of India. Apart from infection control, he is interested in post-transplant infections, orthopaedic infections and PK PD considerations of antibiotics. He is active member of Association of Physicians of India, Clinical Infectious Diseases Society of India, HIV Medicine Association of India, Indian Medical Association and the National Academy of Medical Sciences.

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Integrating electronic medical records to improve antimicrobial stewardship at the Montpellier Hospital in France

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ABSTRACT: Improvements in the optimal use of antibiotics is the cornerstone of the French national point-of-care alert for antibiotics (2011–2016). Integrated electronic medical records for antibiotic prescriptions have been deployed in the Montpellier University Hospital (2,800 beds) since 2012. The present paper proposes an overview of integrated electronic medical records for antibiotic prescriptions and how telecounselling at the Montpellier Hospital fits with the global anti-infection ICT strategy. This management change is fully traceable. A review of the results of the project has lead to an improvement in patient care via a collaboration between IDS and other hospital members. This project is part of the Region Reference site of the European Innovation Partnership on Active and Healthy Ageing (MACVIA-LR).

Improving the optimal use of antibiotics is the cornerstone of the French national point-of-care alert for antibiotics (2011–2016 *(1)*). It is based on care pathways and the development of ICT tools for the diagnosis of infectious diseases and the prescription of antibiotics. The alert is aimed at reducing the overall prescription of antibiotics which is still very high in France in comparison to other European countries.

Integrated electronic medical records for antibiotic prescriptions have been deployed in the Montpellier University Hospital (2,800 beds) since 2012. The present paper proposes an overview of integrated electronic medical records for antibiotic prescriptions and how telecounselling at the Montpellier Hospital fits with the global anti-infection ICT strategy.

Medical context

Multidrug-resistant bacteria are becoming more common and, due to their multiplicity of mechanisms, they are frequently resistant to many, if not all, of the current antibiotics. This has become a global health problem and is increasing in prevalence and severity. Antibiotic resistance can be reduced by using antibiotics following the guidelines of antimicrobial stewardship programmes (ASPs). All major resistance-control strategies recommend education for patients, children (e.g., through schools and day care), the public and relevant health care professionals (e.g., physicians, other health care professionals and medical students) on the unique features of bacterial infections and antibiotics as well as prudent antibiotic prescribing *(2)*. In the early 2000s, over 100 million antibiotic prescriptions were being written each year in France; 80% of these outside hospital care.

Multidisciplinary care pathways for anti-infection treatments

Since 1974, combined with an effective infection control programme, ASPs has been used to help antibiotic prescription in hospital settings by optimizing antibiotic use through expert advice *(3)*. Later, in France, at the end of the 1990s, the recognition of nosocomial infections led to multidisciplinary strategies for their treatment and prevention in ICU and hospital settings *(4, 5)*. These measures were shown to decrease antimicrobial expenditures and improve susceptibilities to antibiotics without compromising patient outcomes or length of hospital stay *(6, 7)*.

In 2008, the French *Haute Autorité de Santé* (HAS) (National Health Agency) recommended that multidisciplinary (health care and social care workers, managers, etc) care pathways should be implemented for antibiotic therapy coordinated by an infectious disease specialist (IDS). Treatment of infections is however a team operation, using the coordinated expertise of many different medical care professionals. The government plan to preserve the efficacy of antibiotics (2005–2006) has evolved a point-of-care alert for antibiotics (2011–2016 *(1)*) to improve the prescription of antibiotic therapy. This alert insists on the need to improve prescribing rules and to deploy care pathways using diagnosis and

treatment aids including ICT tools to all physicians prescribing antibiotics, especially in private medicine. The action plan requires multiple actions which have already been started. A network is being established to include all stakeholders. A thorough evaluation of the plan has been initiated.

Electronic care pathways

Several studies have shown that point-of-care access to current medical information is easily available to the practitioner using ICT through smartphones, iPads and other personal digital assistants *(8, 9)*, websites *(10)* or telemedicine *(11)*. The explosion of medical applications (apps) has made it increasingly difficult to find relevant and reliable infectious diseases apps *(12)*. Moreover, the application of a generic recommendation to a specific case may be difficult. In three hospitals in southern France, there was surprisingly no clear link between applying national recommendations for antibiotic prescription and the optimization of hospital organization or the quality of antibiotic prescriptions *(13)*. Electronic care pathways in infectious diseases are usually difficult to replicate in many populations due to diverse factors including local prescribing habits and bacterial ecology *(14)*. A team in Strasbourg, France, has made computerized practice guidelines accessible to physicians when making clinical decisions to improve prescribing practices. The increased availability of antibiotic guidelines at the time of drug ordering, combined with periodic educational reinforcement, has been associated with enhanced physician adherence to these guidelines *(15)*.

The success of these electronic care pathways depends on several factors:

- The clinical situation should correspond to a care pathway already described.
- Care pathways differ depending on local factors and the settings in which the treatment is to be performed.
- Care pathways should be user friendly and the algorithms not too complex.
- ICT integration should minimize the time-to-decision and allow easy management of the individual patient.

Computerized decision support

Computerized decision support (CDS) is the most advanced form of clinical decision support available and has evolved with innovative technologies to provide meaningful assistance to medical professionals. Practice guidelines implemented through CDS support were implemented in 1985 in Salt Lake City, United States, leaving the final choice to the prescribing physician. The clinical and financial outcomes of these practices were assessed over a period of seven years. Although there was an increase in the number of treated patients (+21.3%), antibiotic use was improved, costs per treated patient (adjusted for inflation) decreased from US$ 122.66 per patient in 1988 to US$ 51.90 per patient in 1994 and the emergence of antibiotic-resistant pathogens stabilized *(16)*.

Since 2000, an evaluation of the clinical effects of health information technology has been carried out for infectious diseases. Electronic prescribing has been shown to reduce prescribing errors in hospitals. Computerized decision support systems have been used to help ensure safe medication prescribing. However, the acceptance of these types of decision support has been reported to be low. They have improved the quality of prescribing by reducing both prescribing errors and pharmacists' clinical interventions *(17-19)*. Computerized physician order entry (CPOE) systems reduce the medical error rates. Prescribing errors in terms of drug allergy, drug interaction and drug dosing errors are reduced if the CPOE system is not error-prone and is easy to use, if the user interface is consistent, and if it provides quality information to doctors *(20)*. However, the use of a CPOE system is insufficient if the following factors are not considered: the correct indication, the choice of antibiotic spectrum, a stepwise strategy and regular follow-up of the treatment.

There are limitations to CDS tools:

- They are used by a series of health care professionals who may not be present in the different settings where they should be applied.
- No IDS may be present in the setting.
- They may be too complex for ICT technicians in many settings.
- They are not universally applicable to the local setting or to the individual patient.

Informal IDS consultations for individual patients

IDS-based advice to other physicians is common in most hospitals. However, this requires a considerable expenditure of time by the infectious disease service. The consultation may also involve the exchange of inaccurate or insufficient information between physicians and the infectious disease service, and is not always followed by an appropriate antibiotic prescription (21). A 5-year study in Israel of 14,005 specialist consultations showed that expenditure on antimicrobials per admission had steadily decreased, from US$ 44 in 1995 to US$ 30 in 1999: a 35% reduction. In conclusion, the analysis of data from IDS consultations enables the infectious disease service to evaluate its activity and to direct efforts towards departments with high rates of nosocomial infections, antimicrobial resistance and/or antimicrobial use *(22)*. In Nice, France, the implementation of an antibacterial and antifungal stewardship programme was feasible, sustainable, well accepted and cost-effective: IDS were able to consult in different hospital wards (1999), specific prescription of antimicrobials (2005), electronic traceability of the advice and prescription formularies in the electronic patient files (2007), pharmacist alerts which can lead to IDS advice (2007), laboratory alerts (2009), and automated extraction of patient files in the form of a table (2011) *(23)*. However, an appropriate budget is still lacking as well as the integration of care pathways into an electronic format in patient files.

In Grenoble, France, in 2011, compliance with recommendations proposed by informal IDS consultations was found to be comparable to formal consultations (88%) without compromising patient safety. Further study is needed to refine the criteria for requesting or providing informal rather than formal consultations *(24)*. On the other hand, IDS consultations may decrease the efforts of clinicians to follow care pathways and educate patients. A 15-year ASP policy in the Nancy Teaching Hospital assessed the impact of reinforcing this policy on antibiotic consumption. Between 2005 and 2008, the overall annual cost of antibiotics dropped by 34% *(25)*.

However, one problem is paying for the time spent by the IDS, as the benefit for the hospital is not yet clear. Moreover, indicators of cost-effectiveness also need to be accepted by payers.

Multidisciplinary antibacterial control programmes

A multidisciplinary approach is often needed for complex infections. This includes the IDS, the physician, the hospital team, the pharmacist, the microbiology laboratory and other health and social care workers.

In Oklahoma, the clinical outcomes and cost-effectiveness of an antimicrobial control programme (ACP) were studied. An ACP directed by a clinical pharmacist trained in infectious diseases was associated with improvements in inpatient length of stay as well as mortality. The ACP decreased intravenous antimicrobial costs and facilitated the approval process for restricted and nonformulary antimicrobial agents *(26)*. However, there is a lack of information concerning the duration of isolation times required to decrease cross-transmission, the duration of antibiotherapy, mortality and costs.

In-hospital antimicrobial approval policies are designed to curb the indiscriminate use of antimicrobials. These policies usually require written forms and/or direct requests to an IDS (or surrogate) prior to the release of antimicrobials. One study attempted to measure the impact on antibiotic use of a computer-generated alert prompting post-prescription review and direct counselling in hospital wards. The computer-prompted post-prescription review led physicians to modify half of the antibiotic courses initially prescribed and was well accepted by the majority, although they had not requested counselling *(27)*. The same group studied the unsolicited and systematic evaluation of positive blood cultures after a laboratory report by a single IDS using a computer-generated alert from the laboratory. The impact of IDS counselling was more effective when the evaluation was restricted to medical and surgical wards *(28)*. In some places, IDS advice was requested for all patients, but this led to a delay in the prescription of antibiotics *(29)*.

The multidisciplinary approach appears to be cost-effective and reduces antibiotic resistance. Antimicrobial therapy for 428 episodes of *Staphylococcus aureus* bacteremia in an 850-bed university hospital was prospectively evaluated for one year to measure the impact of two factors – blood culture results and the therapy chosen by the IDS – on quality of treatment and outcome. Empirical treatment was appropriate in 63% of episodes. This proportion reached 78% for episodes treated by an IDS. After the availability of blood culture results, the proportion of appropriate treatments increased to 94%, with 97% for IDS-treated patients and 89% for other patients. The IDS more frequently shifted to oral antibiotics and used fewer broad-spectrum drugs *(30, 31)*.

Patients' electronic files will allow more systematic approaches. However, data from community ASPs are limited. In Taiwan, clinical and economic outcomes from the first year of hospital ASPs (510 antimicrobial orders) were reviewed. Sixty-three per cent were appropriate, 18% prompted de-escalation, 12 were denied, and 5% led to formal consultation with an IDS. The antimicrobial budget decreased by 15.2% and there was a 25.4% decrease in defined daily doses of the target antimicrobials *(32)*.

Factors improving adherence to CDS and ASP

Real-time CDS and complete traceability (drug and care administration with their respective documentation) are essential in terms of medical approach and patient safety.

The effectiveness of an IDS consultation is dependent on adherence to the recommendations. To delineate the factors that affect adherence, a prospective cohort study of 465 consultations evaluated multiple factors. Adherence to IDS recommendations was higher when the recommendations were therapeutic instead of diagnostic, when they related to a specific clinical question, when recommendations were deemed crucial by the infectious disease service and if the consultation note was legible and organized *(33)*. Adherence to IDS consultations was around 40% in the early 2000s *(34)* and is now up to 91% in some recent studies *(10, 35)*.

Telephone services can provide information and support for APS. It was thought that telephone counselling might be less effective than formal consultation and IDS consultation *(22, 36)* but its impact still requires further studies *(24)*.

ASP implementation in the Montpellier University Hospital

3-1- DXCare® and IPSoins®

APS uses DXCare® (MedaSys and Orange business service, http://www.orange-business.com), the hospital information system used by all members of the Montpellier University Hospital (37). A wide variety of information is managed, and exceptional data collection and record acquisition is provided by IPSoins® which is outstanding for the quality and diversity of the information that it manages. IPSoins® provides hospital health care professionals with one single tool that can be used for all the information it handles: letters, administrative information, requests for/results of tests and imaging, specialist medical files, vocal recordings, databases, etc. Within the framework of research, innovative algorithms and statistical models are being developed, tested and put on the market. The aim is to explore large amounts of information that are heterogeneous and diverse but combined, in order to search for the CDS.

In its standard catalogue, IPSoins® aspires to provide a large number of "career" modules including medical, surgical and psychiatric specialities, obstetrics and follow-up care. In case of missing elements, uncertainties or specific needs such as the management of a clinical study, an extension module using questionnaires is available. This enables the possibility of qualitative management of diseases.

Constructed using ICT, IPSoins® is secure and readily accessible to the other actors involved in the follow-up of patients. Through telemedicine, it is possible for private health care professionals to access part of the medical file from a distance when following up on patients. Such is the case for private doctors and for professionals from the medicosocial sector. This access is highly secure and already possible from sites outside of the Montpellier University Hospital. A very finely-tuned, specific and precise management mechanism allows the administration of rights satisfying the statutory and legal regulations regarding access to patient data.

Application of DXCare® and IPSoins® to ASP

The capabilities of DXCAre® were used to build ASP using existing care pathways recommended in France. These pathways were discussed by a multidisciplinary team and adapted to most circumstances (patient type, hospitalized patient, telemedicine or telecounselling). These pathways make it possible to propose a large variety of management systems.

When requested by any physician from the hospital, an IDS initiates the ASP. A personalized file, provided by one of the five

IDS, is then available for each patient and immediately embedded in the patient file stored in DXCare®. It is therefore available for all carers in the hospital depending on their access code. If needed, the file is reviewed at a once-a-week multidisciplinary consultation. A specific code allows automatic planning before each multidisciplinary meeting. In parallel, a business objective allows the different clinical events and examinations (indexing clinical situations, by pathogen and according to a pre-established comorbidity list) to be followed.

Demographic characteristics of patients enrolled in ASP

A prospective study was carried out between 1 February and 30 October 2013 of all patients enrolled in ASP. Collected data included clinical and biological data at baseline and follow-up during hospitalization after three and five days. Moreover, the follow-up of the patient after discharge was checked.

The files of 870 patients, and 1386 telecounselling consultations led to a management plan immediately embedded in the DXCare® file (mean patient reviewed per day per IUDS: 5.3). Around half of the telephone calls led to an ASP file. In 18.9% of cases, the file was reviewed by the multidisciplinary team. During the initial IDS consultation, 88% of cases were solved without a direct visit to the patient, 26.5% of patients had another evaluation and 8% had more than three. Hospitalized patients were in 46 different wards of the Montpellier University Hospital: 42% came from surgery and 17% from orthopaedics. The antibacterial strategy contained 798 completed files with a reduction of treatment proposed in 25.3% of cases, a discontinuation of treatment in 5.1% and a change in therapy in 2.8%.

Adherence to the management strategy was evaluated in 675 patients. Complete adherence was observed for 86.7% of patients for therapy counselling and 76.9% for diagnosis counselling. Recommendations following the multidisciplinary consultation were followed in 89% of cases. When available, an improvement of biological parameters was assessed between three and five days: CRP decreased in 74% cases, peripheral blood leukocytes in 60%, and fever in 42%. Forty-seven point one per cent of patients were discharged at home and mortality was 6.1%.

Consequences and perspectives

Analysis of the files once every three months allowed us to select topics for monthly bibliographic meetings and to perform CME activities targeted to the major problems encountered. The real-time counselling facilitated the validation of antimicrobial agents. In the wards that most frequently use ASP, a multidisciplinary consultation was set up. Several care pathways were identified and refined (e.g., scars, bone infection and complex post-operative infections).

Analysis of antimicrobial prescription in the different wards led to personalized care pathways which have been embedded in the prescription electronic file and in an algorithm simplifying the pathways. The files have evolved to simplify the questionnaires and to propose preventive strategies.

Several limitations have been noticed. In particular, this observational study can assess neither a comparison of the efficacy with optimal care without ASP nor a cost-effectiveness analysis of an intervention. ASP is time-consuming and variability between IDS exists. Only 45% of all interventions are notified due to lack of manpower. Moreover, the ASP should be extended to private practice and other hospitals in the region.

Finally, this project is part of the region reference site of the European Innovation Partnership on Active and Healthy Ageing MACVIA-LR *(38)*.

Conclusion

Real-time integrated electronic medical records for antibiotic prescriptions and telecounselling by a multidisciplinary team are operating in the Montpellier University Hospital and are in line with the global anti-infection ICT strategy. This management change is fully traceable. The review of the results of the project has led to improvements in patient care through a collaboration between IDS and the other hospital members. ❑

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Business process re-engineering a cardiology department

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ABSTRACT: The health care sector is the world's third largest industry and is facing several problems such as excessive waiting times for patients, lack of access to information, high costs of delivery and medical errors. Health care managers seek the help of process re-engineering methods to discover the best processes and to re-engineer existing processes to optimize productivity without compromising on quality. Business process re-engineering refers to the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality and speed. The present study is carried out at a tertiary care corporate hospital with 1000-plus-bed facility. A descriptive study and case study method is used with intensive, careful and complete observation of patient flow, delays, short comings in patient movement and workflow. Data is collected through observations, informal interviews and analyzed by matrix analysis. Flowcharts were drawn for the various work activities of the cardiology department including workflow of the admission process, workflow in the ward and ICCU, workflow of the patient for catheterization laboratory procedure, and in the billing and discharge process. The problems of the existing system were studied and necessary suggestions were recommended to cardiology department module with an illustrated flowchart.

The health care sector is the world's third largest industry and it is growing rapidly both in developing countries and developed nations. Health care systems across the globe are facing several problems. The most publicized symptoms are excessive waiting times for patients, lack of access to providers and information, the high costs of delivery and medical errors. As health care costs increase, there is a need for health care service providers and health care managers to contain costs and to achieve a higher efficiency in their operating facilities without scarifying quality *(1)*. Health care managers seek the help of process re-engineering methods to discover the best processes for performing work and re-engineering existing processes to optimize productivity without compromising on quality *(2)*.

According to Hammer and Champy *(3)* business process re-engineering (BPR) refers to the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality and speed. BPR is increasingly recognized as a form of organizational change characterized by the strategic transformation of interrelated organizational subsystems producing varied levels of impact. This organizational change perspective recognizes that BPR is not a monolithic concept but rather a continuum of approaches to process change *(4)*. Despite the significant growth of the BPR concept, not all organizations embarking on BPR projects achieve their intended results *(3)*. It is estimated that as many as 70% of organizations do not achieve the dramatic results they seek. Having BPR repeatedly at the top of the list of management issues in annual surveys of critical information systems reflects executives' failure to either implement properly or acquire the benefits of BPR *(5)*.

This mixture of results makes the issue of BPR implementation very important. It is believed that BPR has great potential for increasing productivity through reduced process time and cost, improved quality and greater customer satisfaction, but it often requires a fundamental organizational change. As a result, the implementation process is complex and needs to be checked against several success/failure factors to ensure successful implementation, as well as to avoid implementation pitfalls. The BPR implementation process can be analysed by reviewing the relevant literature on both the soft and hard factors that cause success and failure of BPR efforts. The factors listed below have been distilled from various articles. They were then categorized into a number of subgroups representing various dimensions of change related to BPR implementation. These dimensions are: change management, management competency and support, organizational structure, project planning and management, and IT infrastructure *(6)*.

Methods

The present study was conducted at a tertiary care corporate hospital in Hyderabad which has been in operation since 1989 with 1000-plus-bed facility. The hospital is serving the health care needs of people of Hyderabad. The research method used is the descriptive study and case study method. The objective of the study is to locate the factors that account for the behavioural pattern of the given unit in an integrated totality. In the cardiology department, scheduled and unscheduled operations often have to coexist and be managed and ways to minimize patient inconvenience need to be studied. The business process re-engineering study for the cardiology department involves intensive, careful and complete observation of patient flow, delays and short comings in patient movement and workflow. It is an in-depth study in minute detail. Primary data is collected through observation, informal interviews and face to face interaction with the department

in charge; secondary data is collected through hospital records. The data is analyzed by matrix analysis which is in the form of flowcharts, diagrams and pictorial representations with written descriptions.

Discussions

In this study, the BPR was useful for the cardiology department to smooth the workflow and reduce the time taken in various processes in the department. The aim of this study is to suggest a better process and reduce the time constraints. A complete process and workflow were studied in detail considering all the sub processes and then dividing them so that time taken up for each sub process can be studied. The process which is taking up too much time or not smoothing the workflow can then be re-engineered.

The workflow of the cardiology department is done for the:

- present process;
- proposed or re-engineered process.

The process is first given in a written form and then it is explained with the help of flowcharts.

Flowcharts help to present the various processes with the aid of different symbols. These charts are very helpful as they mean the processes can be understood very easily.

Business process re-engineering tools are used for improvements and understanding black holes where changes can be made to improve the existing process, with radical rethinking, redesigning and retooling of the business process to achieve drastic changes.

Organizational restructuring

This restructures the organization for BPR by:

- reducing or restructuring the organizational layers;
- realigning functions and work groups around the customer;
- driving accountability to frontline.

Work redesigning

While redesigning work in the organization:

- conducts "customer value added" process analysis of the job task;
- expands job scope and ownership;
- builds cross-functional teams.

Technological retooling

Technological retooling requires the organization to consider:

- increasing the emphasis on process tasks that happen in parallel;
- gathering and communicating customer related data;
- extending access to information and data for all employees.

Starting with the admission process in the cardiology department, every process has been described step by step below.

Workflow of the admission process in the cardiology department as patients are advised of admission and/or cathlab procedure

1 When the patient is advised of admission and/or cathlab process by the doctor.
2 When the patient comes directly from another hospital or is a referred patient.
3 Patient or patient's relatives go to the admission desk with prescription.
4 The admission officer calls the PRE of the cardiac department and asks for the availability of a bed.
5 According to availability, the admission officer allots a bed to the patient and prepares case-sheet.
6 Asks patient to deposit advance payment at the cash counter or sends them on directly if Arogyashri patient or insurance holder or patient under empanelment.
7 PRE informs the housekeeping staff about the admission and asks them to clean and prepare the room.
8 The patient is taken to the department by transport.
9 The PRE in the department informs the nurse about the admission.
10 The nurse in the department checks the case-sheet and sends the patient to the allotted room.

Workflow in ward/ICCU can be described step by step as follows

1 Patient case-sheet is checked by DMO.
2 DMO checks the patient and orders treatment (emergency treatment, if needed) to the nurse.

Figure 1: Flow chart for the existing admissions process for the cardiology department

Figure 2: Flow for workflow in the ward/ICCU

3 The nurse orders medicine from the pharmacy by a system connected by LAN.
4 The nurse sends a courier and receives medicines from the pharmacy.
5 The nurse starts patient treatment.
6 The nurse collects a blood sample and other samples for investigation as ordered by the doctor.
7 The nurse calls the courier and sends the investigation sample to the laboratory.
8 The investigation report is collected by the courier and brought to the department.
9 The DMO collects the report and informs the consultant cardiologist/surgeon.
10 Changes in treatment are noted as per the cardiologist/surgeons by the DMO.

Workflow of the patient for catheterization laboratory procedure

1 When patient is advised of catheterization procedures like PTCA, PDA closure, balloon angioplasty and stenting, or a pacemaker by the doctor.
2 The patient gets admitted to the hospital or in an emergency they are directly taken to procedures after routine investigations.
3 For Arogyashree patients the procedure will be performed after the approval of the case.
4 Investigations of the patient are made after patient gets admitted to the ward (all routine investigations, ECG, 2D echo).
5 Samples are collected in the ward itself and sent to the laboratory for investigation.
6 A report is sent to the ward after investigations by the laboratory.
7 A catheterization lab checklist is checked by the PRE or nurse.
8 On the day of the procedure, a consent form is signed by the patient and patient attendees.
9 The patient is kept NBM for at least six hours before the procedure.
10 Preparation of the patient in the ward.
11 The patient is sent to the catheterization lab or procedure.
12 After the procedure patient is moved to the ICCU.

Figure 3: Flowchart of patient for catheterization laboratory procedure

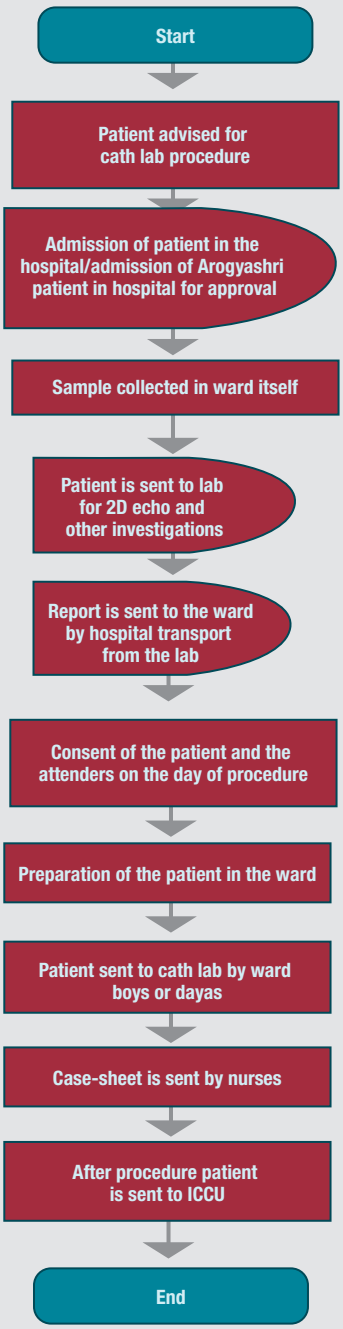
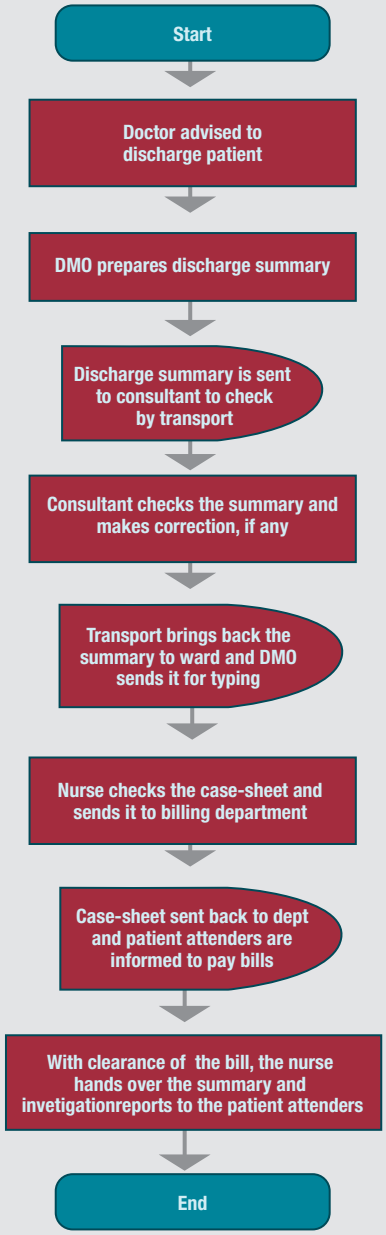


Figure 4: Flowchart for the billing and discharge process



Billing and discharge process for cardiology department

1 Patient is cleared for discharge by the doctor.
2 DMO prepares a discharge summary.
3 Discharge summary is sent to consultant for checking.
4 After checking the discharge summary, corrections are made by the DMO and sent for typing.
5 Case-sheet of the patient is sent to the billing department by transport.
6 After completion of billing, the case-sheet is sent back to cardiology department by transport.
7 PRE informs relatives of the patient to go to the billing counter to pay the bill.
8 A feedback form is filled up by the patient's relatives about the services of the hospital.
9 After payment of the bill, the discharge summary with investigation reports is handed over to the patient by PRE.

Problems in the existing system and possible alternatives

The identification of problems in and solutions for the patient process can be subdivided as follows:

- **There is delay in the admission process in the morning as well as when emergency cases come to the hospital as the use of LAN is not properly used to check the availability of the beds:** A LAN should be introduced at the admissions desk which includes every department to see the availability of beds. Staff should be trained to use LAN as it can save time as well as money.
- **Sometimes transportation of patient is delayed due transport personnel:** Transportation personnel should be always there to receive and carry the patient and one or two transport persons should be posted to every department.
- **Investigation samples are sent to labs through couriers who delay the process and sometimes due to more investigations from OPD:** A separate section for emergency and IPD investigations should be started.
- **Delays in diagnostic tests carried out before cath lab procedures because 2D echo and other machines are used for both OPD and IPD:** A separate set investigations should made available for emergency cases and IPD cases that are undergoing cath lab procedures.
- **DMO's are less in number compared to consultants which makes a reverse pyramid in departmental human resources:** The number of DMOs should be in ratio with consultants and they should only work in one department, otherwise they will be confused and there may be chances of mistakes.
- **In emergency cases there is no availability of costly life saving cardiac drugs like streptokinase, urokinese:** Cardiology department ICCUs should contain life-saving drugs for emergency cases though they account for high costs.
- **After preparing the discharge summary, which is sent to the consultant and again to the DMO to make the corrections suggested by consultant, and then again sent for typing:** Discharge summaries should be prepared on a system connected with LAN and consultants should be provided with systems that can check summaries directly and send to the discharge summary department.

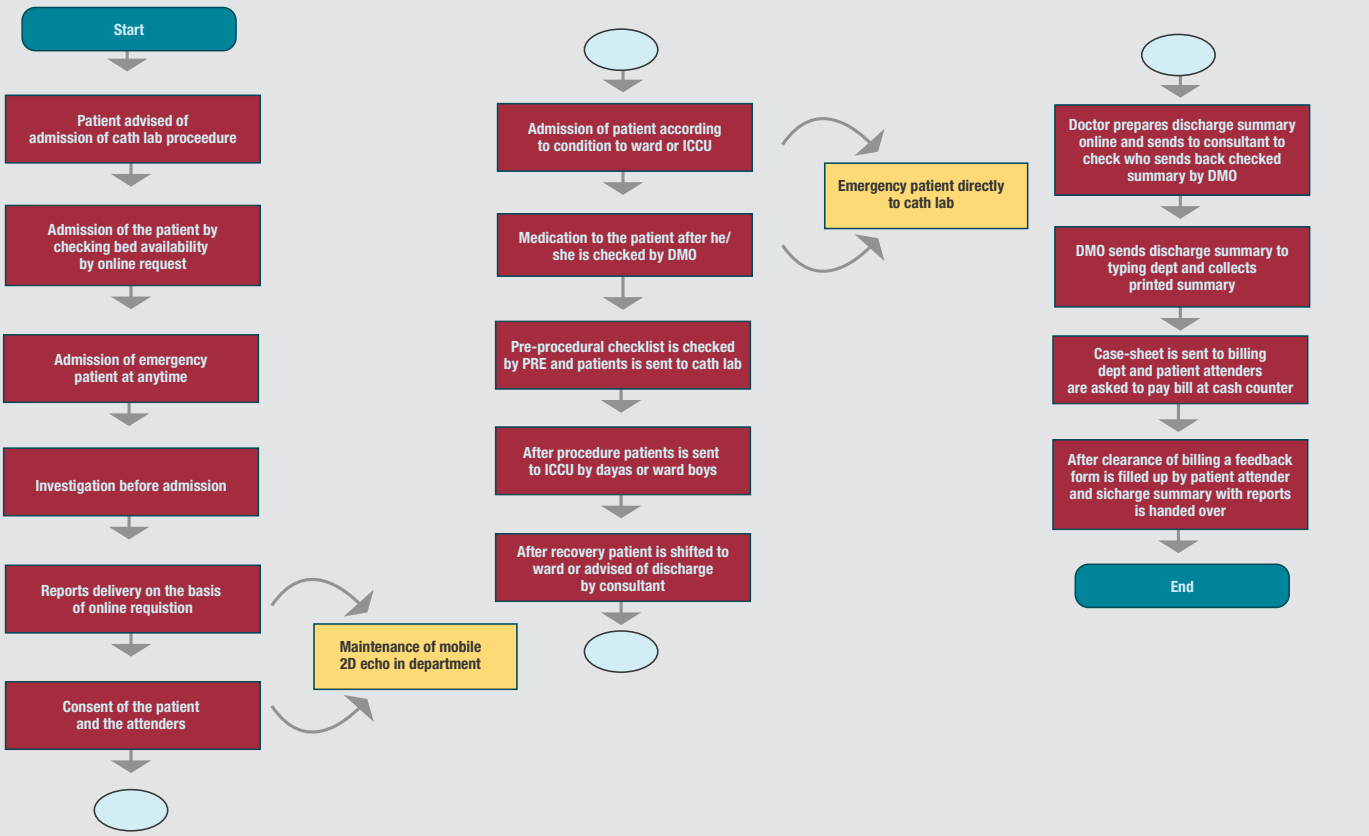
Cardiology department module

The process can be re-engineered by introducing LAN connections and creating a cardiology department module. The module will help in timely processing and less time will be taken for the same work if the cardiology module is prepared for all the major departments, OPDs, laboratories, admission desk, administration department, which can prepare online requisitions and send as needed.

The salient features are as follows:

- **Item master details:** The module stores a list of all the patients and procedures to be done on that particular day.
- **Container master details:** This master module stores a list of all the containers exchanged between cath lab, ward and ICCU.
- **Dispatch details from ward and ICCU to cath lab:** Records details of all the patients which are coming from front office after admission and patients which come under the Arogyashree scheme and other patients having empanelment.

Figure 5: Flowchart of the re-engineered process



- **Pharmacy details:** This module records the medicines ordered and collected from the pharmacy for Arogyashree patients and patients under empanelment.
- **Stock status:** This records details of all the medicines, IV fluids, instruments present in the department.

Proposed changes in existing system

A LAN system with a cardiology department should be implemented and it should be connected with all the other modules of the hospital.

Restructuring

The cardiology department is lacking a manager as the PRE of the department has moved to other department as per needs and hence while restructuring the departmental hierarchy, a permanent PRE is needed and training should be imparted to PRE and to some nurses to use the system, as well as to DMOs to prepare discharge summaries.

- **Redesigning:** The work can be expanded and cross functional team can be formed.
- **Retooling:** Retooling of the system is needed in ICCU as well as in the ward and should be connected with billing, pharmacy, administration and the laboratory where software should be implemented.

Conclusions

BPR has great potential for increasing productivity through reduced process time and cost, improved quality and greater customer satisfaction. As health care systems worldwide are facing problems like excessive waiting times, access to important information, high costs of delivery and medical errors, health care managers should make use of process reengineering methods to discover the best processes for performing tasks, and that processes are reengineered to optimize productivity without compromising on quality. Business process reengineering tools are used for improvements and understanding black holes where changes can be made to improve the existing process, with radical rethinking, redesigning and retooling of the business process to achieve drastic changes. In the cardiology department, scheduled and unscheduled operations often have to coexist and be managed; ways to minimize patient inconvenience need to be studied. The study of business process re-engineering for cardiology department involves intensive, careful and complete observation of patient flow, delays and short comings in the patient movement and workflow.

List of Abbreviations

BPR - Business process re-engineering
DMO - Duty Medical Officer
ECG - electrocardiogram
IPD – inpatient department
LAB - laboratory
LAN – local area network
NBM - nil by mouth
OPD – outpatient department
PDA - Patent ductus arteriosus
PRE- patient relationship executive
PTCA - Percutaneous transluminal coronary angioplasty ❑

Authors' Contributions

The entire work has been carried as an original research. There has been a serious effort to make the research fit to the purpose and be useful for further reference.

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Résumés en Français

Programmes nationaux de prévention et de contrôle: approbation de la qualité des soins

Les infections nosocomiales sont une case majeure de morbidité et de mortalité. Outre la douleur et les souffrances occasionnées, elles pèsent sur les coûts de santé et entraînent des coûts indirects liés à la perte de productivité pour les patients et la société en général.

Depuis 2005, l'Organisation Pan Américaine de la Santé a apporté leur soutien à certains pays pour les aider à évaluer leurs capacités pour la prévention et le contrôle anti-infectieux. On a constaté que plus de 130 hôpitaux de 18 pays menaient des programmes médiocres de prévention et contrôle des infectieux. Cependant, perdus dans de nombreuses priorités médicales concurrentes, ces programmes n'occupent pas une place de choix dans les réunions ministérielles de santé, et la durabilité des programmes nationaux n'est pas considérée comme un point suffisamment important quand il s'agit de rendre les systèmes de santé plus cohérents et plus fiables.

Des programmes complets de prévention et de lutte anti-infectieuses permettront aux pays d'abaisser la morbidité, la mortalité et les coûts des infections nosocomiales et améliorer la qualité des soins. Cet article traite de la pertinence des programmes nationaux de prévention et de lutte anti-infectieuses du point de vue promotion, appui et renforcement des interventions contre les maladies infectieuses au niveau des hôpitaux.

Un engagement résolu de la part des autorités sanitaires nationales au soutien des programmes nationaux contre les infections est indispensable pour réaliser une diminution constante des maladies nosocomiales, abaisser les dépenses médicales qui leur sont imputables et dispenser des soins à moindre risque.

Des stratégies efficaces de lutte contre les infections: l'effet "Eurêka"

La sécurité est désormais un principe fondamental des soins des patients et un élément critique de la gestion de la qualité. Il convient de revoir régulièrement et de remettre à jour les tactiques préventives contre les infections nosocomiales pour qu'elles restent efficaces. Le modèle genevois d'hygiène des mains est un exemple typique de la percée d'une campagne novatrice qui s'est propagée comme une traînée de poudre dans le monde entier après avoir été adoptée par l'Organisation mondiale de la Santé (OMS) comme premier Défi Mondial pour la Sécurité des Patients. Cette campagne est restée une source d'inspiration pour d'autres innovations. Pour encourager de nouvelles technologies révolutionnaires dotées d'un potentiel pour améliorer la sécurité des patients en implantant avec succès la stratégie multimodale de l'OMS, le Centre de collaboration Hôpitaux Universitaires de Genève /OMS pour la sécurité des patients, de même que l'Académie Esculape, ont créé à l'échelle internationale une série de "prix d'excellence de l'hygiène des mains " et les "Prix de l'innovation pour l'hygiène des mains ».

Strategies de planification de la lutte contre les infections nosocomiales

Aux Etats-Unis, d'après les American Centers for Disease Control and Prevention, 99.000 décès annuels sont causés ou influencés par les infections nosocomiales multiples, estimées à environ 1,7 millions de cas. En Europe, sur 25.000 décès par an, 17.000 sont liées à des infections nosocomiales. Aujourd'hui, la sécurité des patients est un enjeu fondamental dans les établissements hospitaliers. Un consensus croissant étayé par des preuves scientifiques se dégage sur le rôle essentiel de l'environnement bâti pour réduire et contenir au maximum ces infections. A ce stade, la contribution de solutions architecturales et les options de développement sont cruciales.

Cet article décrit les principales mesures à prendre contre les infections nosocomiales au niveau de l'architecture et de la planification, en se concentrant sur les services les plus sensibles de l'hôpital: salles d'hôpital, services de soins intensifs et salles d'opération.

Comment les nouvelles technologies peuvent-elles s'imposer dans la culture actuelle des hôpitaux?

Aux Etats-Unis, plus de 90% des hôpitaux utilisent encore les méthodes traditionnelles de désinfection par essuyage et aérosol lancées il y a plus d'un siècle pour protéger les patients contre leur environnement ; l'adoption de nouvelles méthodes à l'échelle internationale est encore plus faible. Des approches innovantes comme la désinfection d'une pièce entière sont mal accueillies en dépit de réductions tangibles des infections nosocomiales. La résistance au changement est souvent due au manque de vraie responsabilisation concernant la sécurité des patients dans les établissements hospitaliers et à des structures d'incitation perverses dans les politiques antérieures de remboursement. Mais tout cela risque de changer dans les années à venir à mesure que les hôpitaux et médecins sont responsabilisés à l'égard des résultats de santé de leurs patients.

Infections nosocomiales: De la mission aux résultats. Harmonisation entre actions et valeurs

Les établissements de santé les plus remarquables du monde sont en fait devenus des chefs de file en montrant l'exemple, et en maintenant les infections nosocomiales au niveau le plus bas possible. La simplicité apparente d'un indicateur cache un système extrêmement complexe. Nous pensons que la difficulté à obtenir de simples points de repère est imputable à la nécessité de fonctionner de façon optimale et constante à différents niveaux

de l'institution. Ce défi peut se résumer en un mot: l'harmonisation. L'harmonisation institutionnelle commence avec la mission et doit être omniprésente. Tenter d'atteindre les objectifs-repère montre bien que l'harmonisation institutionnelle est un objectif fuyant. Nous allons décrire les dimensions et niveaux de notre institution qui influencent notre capacité de rechercher opiniâtrement à améliorer nos indicateurs de prévention des infections nosocomiales, illustrer certaines de nos difficultés et fournir quelques exemples de réussite.

Les besoins du système de santé de l'Inde en matière de lutte contre l'infection

L'apparition de « superbactéries » comme les entérobactéries résistantes aux antibiotiques carbapénèmes dotés d'un schéma de résistance NDM1 constitue à notre époque une grave menace dans les établissements médicaux. Dans les pays en développement, le risque d'infection nosocomiale est 2 à 20 fois plus élevé que dans les pays développés; il peut dépasser 25% dans certains pays. La prévention et le contrôle des infections nosocomiales est cruciale pour améliorer les soins, réduire l'apparition d'organismes multipharmacorésistants et assurer la sécurité. En Inde, des efforts constants sont déployés dans ce sens. La société des maladies infectieuses cliniques de l'Inde et d'autres instituts médicaux ont convenu en 2012 d'une ' Déclaration Chennai' qui a été adoptée par les ministères de santé du gouvernement de l'Inde, et les mesures nécessaires ont été prises pour restreindre le recours excessif aux antibiotiques. Par ailleurs, le concept d'intendance antimicrobienne a été étendu jusque dans la communauté. Cet article évoque des idées nouvelles que nous avons expérimentées dans les Columbia Asia Hospitals de l'Inde pour améliorer le programme de lutte contre les infections nosocomiales.

Des dossiers médicaux électroniques intégrés pour une utilisation plus judicieuse des antimicrobiens – L'exemple de l'hôpital de Montpellier

Optimaliser l'utilisation des antibiotiques est la clef de voûte du système d'alerte national français concernant les antibiotiques sur les lieux de soins (2011-2016). Des dossiers médicaux électroniques intégrés concernant les prescriptions d'antibiotiques ont été instaurés au CHU de Montpellier (2.800 lits) depuis 2012. Le présent article propose une vue d'ensemble des dossiers médicaux électroniques intégrés visant les prescriptions d'antibiotiques et explique comment le service de télé-consultation de l'hôpital de Montpellier rejoint la stratégie mondiale des TIC contre les infections. Ce changement de méthode gestionnaire permet une traçabilité complète. L'analyse des résultats du projet a permis d'améliorer les soins des patients grâce à une collaboration entre le système de prestation intégré et les autres membres de l'hôpital. Ce projet est reconnu comme site de référence régionale du Partenariat Européen d'Innovation pour un vieillissement actif et en bonne santé (MACVIA-LR).

Réingénierie des processus d'affaires au département de cardiologie

Le secteur de la santé est la troisième plus grande industrie du monde et est confrontée à plusieurs problèmes tels que les délais d'attente excessifs pour les patients, le manque d'accès à l'information, les coûts élevés des prestations et les erreurs médicales. Avec l'aide de méthodes de processus de réingénierie, les gestionnaires de soins de santé cherchent à découvrir les meilleurs procédés pour effectuer un travail, et ces procédés sont repensés pour optimiser la productivité sans compromettre la qualité. La réingénierie des processus se réfère à la remise en question fondamentale et la réorganisation radicale des processus d'affaires pour obtenir d'importantes améliorations dans des mesures contemporaines essentielles de la performance, tels que le coût, la qualité et la vitesse. La présente étude a été réalisée dans un hôpital de soins tertiaires qui compte plus de 1000 lits. Une étude descriptive et une méthode des études de cas ont été utilisées avec une observation intensive, soignée et complète des flux de patients, des retards et des lacunes dans le mouvement et le flux du travail.

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Resumen en Español

Programas nacionales de prevención y control de infecciones: aprobando la calidad de la atención

Las Infecciones intrahospitalarias (IIH) son una causa importante de morbilidad y mortalidad. Aparte del dolor y el sufrimiento, las IIH aumentan el costo de la salud y generan costos indirectos derivados de la pérdida de productividad de los pacientes y la sociedad en general.

Desde 2005, la Organización Panamericana de la Salud ha prestado apoyo a los países para la evaluación de sus capacidades en la Prevención y Control de Infecciones (PCI). Se han encontrado más de 130 hospitales en 18 países con bajos programas PCI. Sin embargo, en medio de muchas otras prioridades de salud, los programas PCI no son una prioridad en la agenda de los ministerios de salud, y la sostenibilidad de los programas nacionales no se ve como un punto clave en la creación de sistemas de salud más consistentes y confiables.

Los programas PCI permitirán a los países reducir la movilidad, la mortalidad y el costo de las infecciones intrahospitalarias y mejorar la calidad de la atención. En este trabajo se aborda la relevancia de los programas Nacionales de Prevención y Control de Infecciones (PNPCI) en la promoción, el apoyo y el refuerzo de las intervenciones de PCI a nivel de los hospitales.

Un fuerte compromiso por parte de las autoridades sanitarias nacionales en apoyo de los programas nacionales de la PCI es crucial para la obtención de una disminución constante de las infecciones intrahospitalarias, la reducción del costo de la salud debido a estas infecciones y la garantía de una atención más segura.

Provocar Momentos "Eureka" para Estrategias de control de infecciones eficaces

La seguridad es ahora un principio fundamental de la atención al paciente y un componente crítico de la gestión de calidad. Las estrategias de prevención de infecciones asociadas a la salud deben ser constantemente revisadas y actualizadas para que sean eficaces. El «Modelo de higiene de las manos de Ginebra» es un ejemplo típico de una campaña innovadora que se lanzó y se difundió por todo el mundo, gracias a su adopción por parte de la Organización Mundial de la Salud (OMS) como el Primer Desafío Global de la Seguridad del Paciente. La campaña sigue siendo una inspiración para seguir innovando. Para alentar a las nuevas y revolucionarias tecnologías con el potencial de mejorar la seguridad del paciente a través de la adopción exitosa de la estrategia multimodal de la OMS, el Hospital Universitario de Ginebra / Centro de Colaboración de la Seguridad del Paciente, junto con la Academia Aesculap, han creado una serie de "Premios Excelencia a la Higiene de las Manos" y "Premios a la Innovación en higiene de las manos" en todo el mundo.

Estrategias de planificación para el control de infecciones nosocomiales

De acuerdo a los Centros para el Control y la Prevención de Enfermedades, en EE.UU. 99 000 muertes al año son causadas o influenciadas por múltiples infecciones intrahospitalarias IIH, estimadas aproximadamente en 1,7 millones. En Europa de 25.000 muertes al año, 17.000 están vinculados a las infecciones nosocomiales. La seguridad del paciente es una cuestión fundamental en los entornos médicos de hoy en día. Existe un consenso cada vez mayor, con el apoyo de las investigaciones científicas, donde se considera el papel central del entorno de la construcción para la minimización y el control del nivel de tales infecciones.

La contribución de las soluciones arquitectónicas y opciones de planificación en este nivel son cruciales.

Este documento resume las medidas más comunes para adoptar a nivel de arquitectura y planificación en contra de las IIH, centrándose en las áreas más críticas del hospital: las salas, las unidades de cuidados intensivos y las salas de operaciones.

¿Cómo pueden las tecnologías emergentes de desinfección imponerse en la cultura actual de los hospitales?

En los EE.UU., más del 90% de los hospitales siguen utilizando únicamente el tradicional método de desinfección "rocíe y limpie" iniciado hace más de un siglo para proteger a los pacientes de su entorno; la adopción de nuevos métodos internacionales es aún muy baja. Enfoques innovadores como la desinfección del cuarto entero encuentran una recepción hostil a pesar de las reducciones claramente superiores en infecciones intrahospitalarias. Gran parte de esta resistencia se debe a una falta de verdadera rendición de cuentas por la seguridad del paciente en los organismos hospitalarios y a las estructuras de incentivos perversos en las políticas históricas de reembolso. Pero todo eso puede cambiar en los próximos años, cuando los hospitales y los médicos se vuelvan más responsables de los resultados de salud de sus pacientes.

Infecciones nosocomiales: De la Misión a los Resultados. Armonización entre Acción y Valores

Las Instituciones sanitarias más destacadas de todo el mundo lideran dando el ejemplo, y manteniendo las infecciones intrahospitalarias a un mínimo posible. Tras la aparente simplicidad de un indicador, se esconde una complejidad enorme. Creemos que la dificultad para conseguir unos aparentemente sencillos puntos de referencia se debe a la necesidad de funcionar de forma óptima y constante en los diferentes niveles de la organización. Este desafío puede resumirse en una palabra: la armonización. La armonización Institucional comienza con la misión y debe ser omnipresente. Alcanzar el punto de referencia ilustra cuán difícil es

alcanzar la armonización institucional. Vamos a describir las dimensiones y niveles de nuestra institución que influyen en nuestra capacidad para luchar por mejores indicadores en la prevención de las infecciones nosocomiales, ilustrar algunas de nuestras dificultades y dar algunos ejemplos de éxito.

Las necesidades de control de las infecciones en el sistema de salud de la India

La aparición de «superbacterias» como la enterobacteriácea resistente al Carbapenem con patrón de resistencia NDM1, es una situación grave en las instalaciones clínicas en los tiempos actuales. El riesgo de infecciones asociadas a la atención sanitaria (IRAS) en los países en desarrollo es de 2 a 20 veces más alta que en los países desarrollados; en algunos países, la proporción puede superar el 25%. La prevención y control de las infecciones en los hospitales es fundamental para mejorar los cuidados, reducir la aparición de organismos resistentes a múltiples fármacos y garantizar la seguridad. En la India varios esfuerzos constantes se están llevando a cabo en este sentido. La Sociedad de Enfermedades Clínicas Infecciosas de la India, junto con otras sociedades, ha lanzado la 'Declaración de Chennai "en 2012, que ha sido adoptada por los departamentos de salud del Gobierno de la India y se han tomado las medidas necesarias para restringir el uso indiscriminado de antibióticos. Asimismo, se está ampliando el concepto de la administración de antimicrobianos, incluso a la comunidad. Compartimos en este artículo algunas ideas nuevas que probamos en los Hospitales Columbia Asia, para mejorar el programa de control de infecciones hospitalarias.

Historias clínicas electrónicas integradas para mejorar la administración de antimicrobianos – El ejemplo del Hospital de Montpellier

El mejoramiento de la utilización óptima de los antibióticos es la pieza clave del sistema de alerta nacional francés en los puntos de atención para los antibióticos (2011-2016). Se han desplegado historias clínicas electrónicas integradas para las prescripciones de antibióticos en el Hospital Universitario de Montpellier (2.800 camas) desde el año 2012. El presente trabajo propone una visión general de la historia clínica electrónica integrada para las prescripciones de antibióticos y la forma como el tele-asesoramiento del hospital de Montpellier encaja con la estrategia general de las TIC anti infecciosas. Este cambio en la gestión permite realizar una trazabilidad completa. La revisión de los resultados del proyecto ha permitido mejorar la atención al paciente mediante una colaboración entre el Hospital y el sistema de prestación integrada. Este proyecto hace parte de la referencia de la región de la Asociación Europea de Innovación en Envejecimiento Activo y Saludable MACVIA-LR.

Reestructuración de los procesos comerciales en el departamento de cardiología

El Sector de la salud es la tercera industria más grande del mundo y se enfrenta a varios problemas, como los tiempos de espera excesivos para los pacientes, la falta de acceso a la información, los altos costos de ejecución y los errores médicos. Los Administradores de la Salud buscan descubrir, con la ayuda de métodos de procesos de reingeniería, los mejores procesos para realizar el trabajo, estos procesos deben estar rediseñados para optimizar la productividad sin comprometer la calidad. La Reingeniería de los procesos comerciales se refiere a la revisión fundamental y el rediseño radical de los procesos comerciales para alcanzar importantes mejoras en las medidas esenciales y contemporáneas del rendimiento, tales como el costo, la calidad y la velocidad. El presente estudio se llevó a cabo en un hospital de tercer nivel corporativo con capacidad de más de 1,000 camas. Se utilizó un método de estudio de casos y un estudio descriptivo con una observación intensiva, cuidadosa y completa del flujo de pacientes, de los retrasos y las deficiencias en el movimiento y el flujo del trabajo.

International Hospital Federation

The voice of the international health care community

2014 Corporate Partnership Programme

Supporting collaboration, ideas and innovation in global healthcare

Who We Are

Founded in **1929**, the **International Hospital Federation** (IHF) is the leading global body representing **public and private national hospital and healthcare associations**, departments of health and major healthcare authorities; with **members** from some **100 countries**.

Our vision and objectives

The founding philosophy of the IHF is that it is the right of every human being, regardless of geographic, economic, ethnic or social condition, to enjoy the best quality of health care, including access to hospital and health care services. By promoting this value, the **IHF supports the improvement of the health of society**.

The objective of the IHF is to develop and maintain a spirit of cooperation and communication among its members and other stakeholders so as to create an environment that facilitates the **cross – fertilization and exchange of ideas** and information in healthcare policy, finance and management.

The role of the IHF is to help international hospitals and healthcare facilities work towards improving the level of the services they deliver to the population regardless of the ability of the population to pay. The IHF recognizes the **essential role of hospitals and health care organisations** in providing health care, supporting health services and offering education.

The IHF is a **unique arena** in which all major hospital and health care associations are able to address and act upon issues that are of common and key concern.

What IHF Accomplishes

- **Projects** aimed at supporting and improving delivery of hospital and healthcare services.
- Regular and extensive **collaboration** with governmental and non-governmental organizations in developing health systems.
- Creation of "**knowledge hubs**," through its international conferences, education programmes, information services, publications and consultations.
- In official relations with the World Health Organization (WHO) and the Economic and Social Council of the **United Nations** (ECOSOC), it is strategically positioned as a bridge between IHF members, the United Nations.
- Acts as a **global facilitator for health care delivery** among and between key governmental and non-governmental stakeholder organisations.

What Is the Corporate Partnership Programme?

The IHF Corporate Partnership Programme, launched in 2009, is an **opportunity** presented to major corporations seeking to join IHF members in working to improve hospital and **healthcare performance** around the world.

Partnership is open to a limited number of companies who are fully engaged in the **global health sector** and have a **good reputation** as providers. Affiliation with this Partnership Programme gives a strong signal to the global community that the Corporate Partner is a major world player in the hospital and healthcare sector.

The Partnership package provides **access to hospital and healthcare decision makers** from around the world. The Progamme provides an exclusive opportunity for relationship building and sharing of ideas and experiences between corporate leaders and executives in the hospital and healthcare sector. **Dialogue** through this platform will ultimately introduce new ideas and expand knowledge in the healthcare market.

The benefits of the Programme are designed to maximise interaction between actual and potential clients through a **"one-stop shop" approach**.

Opportunity to ultimately create a **corporate leadership body**, to act as a neutral platform for wide-ranging intra-industry discussions on issues of mutual concern beyond and outside of traditional parameters of marketing in order to **foster collaboration** and **enhance confidence** in commercial relations in the health sector as well as **performance** and quality of services and **life** to the **community** at large.

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(For the 2-year option, payment can be made on annual basis)

- ***Letter of Agreement***
  The Corporate Partnership is established upon signature of a letter of agreement by representatives of both the International Hospital Federation and an authorised signatory of the Corporate Partner organisation.

Application

For additional information, please contact:

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For more information, contact Christina Bivona-Tellez, CBivona-Tellez@esri.com. www.esri.com/health

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IHF events calendar

2014
IHF

IHF Group Purchasing – Special Interest Group Conference
Transforming purchaser/supplier cooperation to improve health care efficiency: A global challenge
4–5 November 2014, Paris, France

4th IHF Hospital and Healthcare Association Leadership Summit (By invitation only)
Seoul Korea For more information, contact sheila.anazonwu@ihf-fih.org

2015 IHF 39th World Hospital Congress
6–8 October 2015, Chicago, USA
For more information, contact sheila.anazonwu@ihf-fih.org

2016 IHF 40th World Hospital Congress
Durban, South Africa For more information, contact sheila.anazonwu@ihf-fih.org

2017 IHF 41st World Hospital Congress
November, Kaohsioung City, Taiwan
For more information, contact sheila.anazonwu@ihf-fih.org

2014
MEMBERS

Colombia

IV Feria Internacional de la Salud, Meditech 2014
12–15 August 2014, Bogotá, Colombia

XI Congreso Colombiano de Hospitales y Clínicas
13–14 August 2014, Auditorio Corferias, Bogotá, Colombia
More information: www.achc.org.co

Australia

The Australian Healthcare and Hospitals Association's 2014 Congress "The Quantum Leap: Innovation - Making Quality Count", in collaboration with the Australian Council on Healthcare Standards

8–10 September 2014, Sydney, Australia
This Conress will focus on quality improvement in the healthcare sector.
More information is available by contacting: swright@ahha.asn.au

We welcome the interest and participation of IHF members in this Congress.

Austria

17th European Health Forum Gastein
1–3 October 2014
More information http://www.ehfg.org/home.html

Korea

2014 Korea Healthcare Congress at 63 Convention Center
12–14 November 2014, 63 Convention Center, Seoul, Korea
Organized by The Korean Hospital Association
More information http://koreahealthcarecongress.com/eng/inv/

Portugal

5th International Hospital Congress APDH
20–22 November, Lisbon, Portugal
"The National Health Service - (Re) Cognize the Changes"

2014
COLLABORATIVE

ISQua's 31st International Conference
5–8 October 2014, Windsor Barra Hotel, Rio de Janeiro, Brazil
More information on http://www.isqua.org/conference/rio-de-janeiro-2014

For further details contact: IHF Partnerships and Projects, International Hospital Federation,
151 Route de Loëx, 1233 Bernex, Switzerland; E-mail: sheila.anazonwu@ihf-fih.org or visit the IHF website: http://www.ihf-fih.org

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More information will be forthcoming at **www.ihf-fih.org**, but for now, save the date!

International Hospital Federation

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