Foreword

ARTICLE BY DR. JOSÉ CARLOS ARRABÃO
President-Designate, International Hospital Federation

The International Hospital Federation is an institution that brings together hospitals and health services from more than 100 countries and aims to promote greater cooperation and integrate with the health sector to provide quality of care and safety to patients around the world. It is also a facilitator for the management and improvement of health services, through increasing and stimulating continuing education, training, and information exchange among the multidisciplinary team.

Every two years the IHF holds a World Congress and this time it takes place in a Latin American country, from 10 – 12 November 2009, in Brazil. The 36th World Hospital Congress of the IHF will happen in the main tourist area of the country: Rio de Janeiro.

The main theme of the Congress will be: “Healthcare in the Knowledge Era” which will discuss important issues about health such as: healthcare in Latin America; globalization in healthcare; management and health systems; patient-centred healthcare; information technology; impact on patients; healthcare and costs; public-private partnerships; international experiences; engineering-architecture and modernization of healthcare: international experiences; qualification and accreditation; evidence-based decision-making in healthcare; corporate governance in the health sector; the impact on healthcare of judicial decisions; influence of the medical and pharmaceutical industries on healthcare; key challenges in human resources; patient safety and quality improvement; hospital preparedness for crisis situations; making hospital smoke free and opportunities for developing the private sector. Besides the scientific programme, we will promote a Medical Devices Expo. Services an international fair: with products, equipment and services. The expectation is that companies will introduce the new devices and make contacts with other companies, during the event.

With this strength and determination, we hope that the health professionals, leaders, opinion formers, will provide a major forum for exchange of experiences, views and strategies that intend to offer a better service for the world’s population.

We expect all professionals here in Brazil for the 36th World Hospital Congress in Rio de Janeiro in 10 – 12 November 2009.
Introduction

ARTICLE BY ERIC de ROODENBEEK
Director General, International Hospital Federation

The reference book is always an opportunity for IHF members to share innovative practices and techniques. It is also an opportunity to hear from around the world. This year's edition will not be different in format than the ones you have been used to in the past. A large number of the articles will allow readers to capture the essentials of what is happening in the healthcare services from various parts of the globe.

We are grateful of the efforts made by our WHO colleagues who have provided articles. We also want to express our strong appreciation to all the other authors who contributed to this edition. Beyond their individual contributions, their participation on behalf of the organization they work for reflects also the strong willingness of IHF to be a centre for the cross fertilization of ideas. Those working in hospitals know how the relation with the other health systems' components affects service delivery, that all management related issues are critical for performance, that information technology, equipment and building are vital in providing adequate responses to population, and that medical practice is the core of activities undertaken under the auspice of hospitals. Diversity of subject matter may give a feeling that we are scattered. But this diversity is certainly the stronger message to reflect how the hospital world is holistic. To reflect the activities of hospitals there is no other approach than to consider issues in these different areas. There is the ambition to be comprehensive, but to give an overview of key subjects.

The IHF is very much attached to the participation of the WHO regions in the IHF Reference Book the strength of our mutual relations built over the years. Because regional perspectives are not alike it is obvious that subjects are of various natures. In Africa the priority is to streamline the activities around a programme of intervention reflecting at the same time the mission and comparative advantage of WHO, and the very specific needs of the countries of this region. Because capacity is critical to enhance service delivery, WHO is strengthening intercountry support teams in Africa. Although there is a strong demand from the countries, these teams have not yet responded to the issue of hospital performance improvement. Let's hope that this will be a next step in which IHF would be involved on behalf of its members. Both, the Americas and the Western Pacific region have emphasized their role in collecting, analysing and disseminating health information. The initiative of the Australian health care and hospital association on strategies to kick-start the implementation of health informatics opens an avenue for others to engage further on this subject. From information system to e-health the short cut is obvious as both rely on similar technologies. But although promises are very high, progress remain slow, especially in low income countries. Learning from lessons from previous experiences is critical to enhance this approach that should contribute to improving provision of services. Infrastructures are often the symbol of hospitals and it is true that hospitals require important investment in building. But minds are evolving with a growing interest in the patients needs rather than focusing on civil works. Hospitals are serving humans who are not only made of bone and flesh but who have important psychosocial needs. Taking better in consideration these needs is part of the healing process. In a world of growing tension, neuropsychiatric disorders are becoming a major health burden hospitals have to face, even in low income countries deprived of almost everything. This trend is not yet enough recognized but it echoes the concern to provide buildings that are more respectful of individual psychology.

Hospitals are also very sensitive to medical progress. It is therefore important to reflect the new technologies that may dramatically change the perspective of treatments. It would be impossible to cover all these innovations in all the fields. Because of the importance of cancer it is worth to better understand how proton therapy stands against radiotherapy treatment. These techniques represent massive investments from the hospitals and therefore it is more than welcome to assess results to guide decision makers. For all the costly treatments, systematic cost benefit analysis should now be a common approach before scaling up; we are far from this because of the pressure of expectation linked with new treatments.

This overview is a flavour of what can be expected in this edition of IHF Reference Book. Please do not consider what you will be reading static material, do react to the various articles either by comments or by providing additional material that would contribute to increase knowledge. IHF would be more than happy to follow up with you through our World Hospitals and Health Services quarterly journal or through our other publications.

An open book is the beginning of a story to be shared but it is also the beginning of a story to be written. With this edition we share with you what we believe is relevant, now it is your turn to share with us what you believe should be the next edition.

ARTICLE BY DR LUIS GOMES SAMBO
The Regional Director, World Health Organization Regional Office for Africa


During the 2006-2007 biennium, in line with World Health Organization global agenda defined in the Eleventh General Programme of Work and Strategic orientations for WHO action in the African Region 2005–2009, the Secretariat provided support to Member States towards:

- strengthening their health systems;
- addressing the burden of HIV/AIDS, tuberculosis and malaria;
- combating communicable and noncommunicable diseases;
- addressing child survival and maternal mortality;
- ensuring healthy environments;
- and responding to emergencies.

In order to bring WHO presence closer to countries, the Regional Office pursued decentralization of functions and resources, and the strengthening of WHO country offices. Three Intercountry Support Teams were established in Harare, covering Eastern and Southern Africa; Libreville, covering the countries of Central Africa; and Ouagadougou, covering West African countries.

The Regional Office further expanded and strengthened its partnerships for health. Thus, in collaboration with the African Development Bank, Joint United Nations Programme on HIV/AIDS, United Nations Population Fund, United Nations Children’s Fund, and the World Bank, WHO established the Harmonization for Health in Africa initiative aimed at assisting Member States of the African Region to efficiently mobilize and utilize investments in health.

Harmonization for Health in Africa actions are fully in line with the Paris Declaration on Aid Effectiveness. In June 2007, the Regional Office launched the first issue of The African regional health report: the health of the people highlighting the burden of preventable diseases, the solutions that are available by scaling up proven public health interventions, and the achievements made. The report received wide recognition as an unbiased and constructive reflection on the health situation in the Region.

The strengthening of health systems came into focus on the global health agenda during the biennium. WHO advocated for resource mobilization and provided technical support to countries resulting in substantive Global Alliance for Vaccines and Immunization grants to 15 countries for strengthening health systems; revision of national health policies; development of national health strategic plans; and assessment of district health systems. These efforts also resulted in the strengthening of medicines regulatory authorities in 12 countries as well as the creation of the Regional Human Resources for Health Observatory and the inception of national observatories in six countries.

In relation to the fight against HIV/AIDS, WHO supported 17 countries to update national guidelines on case management of sexually-transmitted infections. Support to the prevention of mother-to-child transmission (PMTCT) of HIV resulted in a rise in the number of women accessing PMTCT services from 190,000 in 2004–2005 to 300,000 in 2006–2007. Likewise, by the end of December 2007, 1.9 million persons living with HIV/AIDS had received antiretroviral therapy, representing 42% of those in need. Epidemiological estimates indicated an overall trend toward stabilization in the occurrence of new HIV infections in sub-Saharan Africa, and a decline in some countries. Member States strengthened implementation of collaborative HIV/tuberculosis activities. The average proportion of TB patients screened for HIV increased from 2% at the end of 2005 to 14% by the end of 2007. This proportion reached 75% in a few countries.

The Regional Office provided technical support for the preparation of the 2006 Abuja Summit on HIV/AIDS, Tuberculosis and Malaria. By the end of 2007, 41 countries had adopted artemisinin-based combination therapy for malaria. During 2006–2007 the Global Fund to Fight AIDS, Tuberculosis and Malaria approved 27 proposals with a malaria component. Over
Millennium Development Goals related to maternal and newborn health, bringing the total to 37 countries. UNFPA, UNICEF and WHO combined their efforts to train country experts from eight countries on translating the Road Map into district operational plans. Prevention and control of cervical cancer received increased attention during 2006-2007. Regional training was provided in both visual inspection with acetic acid and cryotherapy treatment. At its fifty-sixth session, the Regional Committee for Africa adopted Resolution AFR/RC56/R4 to address the health challenges of poverty. At its fifty-seventh session, the Committee endorsed the document entitled Key social determinants of health: a call for intersectoral action to improve health status in the African Region.

Half of the Member States in the African Region faced emergencies during the biennium. Therefore, the Regional Office strengthened country capacities for response and posted experienced international staff in the most affected countries and on the Intercountry Support Teams.

33 the fight against malaria resulted in significant declines in malaria morbidity and mortality. The prevention and control of other communicable diseases continued to be a priority for WHO actions in the African Region. The Regional Office reviewed implementation of interventions against dengue/hemorrhagic fever and typhus in seven countries as free of local transmission of the disease. Between 2006 and 2007, the annual incidence of the disease decreased by 28%. The efforts towards elimination of yaws remained challenges of poverty. At its fifty-seventh session, the Committee endorsed the document entitled Key social determinants of health: a call for intersectoral action to improve health status in the African Region.

Half of the Member States in the African Region faced emergencies during the biennium. Therefore, the Regional Office strengthened country capacities for response and posted experienced international staff in the most affected countries and on the Intercountry Support Teams. Advocacy and support to countries in fund raising resulted in the mobilization of over US$ 78 million for emergency relief activities during the biennium. At its fifty-seventh session, the Regional Committee for Africa adopted Resolution AFR/RC57/R2 for implementation of the regional food safety strategy. Countries received Regional Office support for training in food safety. Outbreaks of foodborne diseases, such as acute aflatoxin poisoning in Kenya and bromide intoxication in Angola, were investigated with strong technical support, resulting in implementation of suitable control measures. In administration and finance, the Regional Office implemented WHO contractual reform, resulting in the establishment of over 1200 fixed-term posts to replace previous temporary positions. For the 2006-2007 biennial period, WHO expenditures in the African Region amounted to US$ 786.7 million, based on 31 December 2007 records, representing 82.8% of the approved budget. The Regional Office monitored the implementation of 16 resolutions of the Regional Committee for Africa taken during the period 2003–2007.
The role of hospitals in enhancing public health security: perspectives from the Eastern Mediterranean Region

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Abstract: Hospitals are an integral part of a healthcare system and their ability to mount an effective response in the face of threats to global health security depends largely on the performance of the healthcare system itself. In the last two decades, 15 of the 22 countries in the Eastern Mediterranean Region (EMR) covering 85% of the population have been directly or indirectly involved in conflict situations. Six EMR countries Afghanistan, Iraq, Sudan, Palestine, Somalia and Lebanon have or are currently experiencing complex emergencies. Although the basic approaches for reducing impact of disasters are preparedness and mitigation, and response, the past practices in the Eastern Mediterranean have historically focused upon post-disaster response and humanitarian assistance efforts and the need to work on disaster risk and preparedness has tended to “fall between the cracks”.

The critical role of hospitals in protecting public health security has been recognized in the region for some years. The key interventions include: (a) adoption of a strategic framework to safeguard hospitals and health facilities from external forces; (b) Adoption of the regional strategy and implementation of a region-wide survey for safer hospitals and health facilities in 2003; (c) mounting an emergency response to operationalize hospitals in the event of natural disasters and catastrophic emergencies; and (d) development of an e-Atlas of Disaster Risk.

The broad directions for ensuring an effective role of hospitals for protecting public health security in countries of the EMR include (a) ensuring that hospitals, especially those that are newly constructed are resilient to the risks of natural disasters, (b) ministries of health should ensure that the hospitals are well prepared and capacities developed to effectively respond to disasters and emergencies; and (c) development partners and civil society organizations should help minimize the consequences of disasters by better collaboration with the national government to achieve great harmony and alignment in the event of a disaster.

Public health security is defined as the activities required, both proactive and reactive, to minimize vulnerability to acute public health events that endanger the collective health of national populations and global public health security concerns populations living across geographical regions and international boundaries. In a rapidly changing global landscape, no country or region can be considered to be a health sanctuary that is safe from the threat of global health insecurity. In a highly mobile, interconnected and interdependent world the natural disasters and conflicts as well as the threats of the rapid spread of infectious diseases and radio nuclear and toxic wastes is ever increasing. Are the healthcare systems and particularly hospitals prepared to face these challenges is a question that has yet to be adequately dealt with.

The Eastern Mediterranean Region (EMR) is home to over 500 million population living in 22 independent as well as occupied states. There are approximately 8,500 big and small, public and private hospitals in the region. Hospitals are an integral part of a healthcare system and their ability to mount an effective response in the face of threats to global health security depends largely on the performance of the health system itself.

The purpose of this paper is to raise awareness and propose strategies for enhancing the preparedness of hospitals in the EMR so that they are able to expeditiously respond in the event of threats to public health security in and beyond the region.

Health security challenges
International health security threats include emerging and rapidly spreading diseases, including the lurking danger of outbreaks of avian influenza and the impending threat of an avian influenza pandemic, environmental change, the danger of bioterrorism, sudden and intense humanitarian emergencies caused by natural disasters, civil strife including ever increasing political instability, chemical spills or radioactive accidents, the impact of HIV/AIDS. The Commission on Human Security report places health crisis during war, internal conflict and sparks of violence in the EMR have increased the vulnerability of populations. In the last two decades,
15 of the 22 countries covering 85% of the population have been directly or indirectly involved in conflict situations. Six EMR countries Afghanistan, Iraq, Sudan, Palestine, Somalia and Lebanon have or are currently experiencing complex emergencies, comprising 19% of the regional population, that have left over 200,000 dead and over 3 million displaced, in addition to very poor health status indicators. United Nations Emergency Relief Coordinator described the complex emergencies in Somalia, Sudan and Palestine – all in EMR – as the three most challenging, current, humanitarian situations in the world. In addition, Yemen, Syntan Arab Republic, Egypt, Lebanon, Somalia, Iran and Pakistan have experienced floods, droughts, earthquakes and landslides. More recently the major earthquakes in Iran and Pakistan affected large numbers of people and had significant material losses. Basic approaches for reducing impact of man-made and nature disasters are preparedness and mitigation, and response. Though both elements are critical, past practices in the Eastern Mediterranean in disaster management have historically focused upon post-disaster response and humanitarian assistance efforts and the need to work on disaster risk and preparedness has tended to “fall between the cracks” of the grander frameworks of development cooperation and emergency.

Role of hospitals in promoting public health security

Hospitals are facing new and emerging threats – both man-made and natural – with increasing frequency. Some of these are foreseeable, such as floods, cyclone, earthquakes and conflicts, while others are emerging as new threat such as pandemics and the risk of chemical or nuclear fallout. Hospitals thus need to maintain and regularly upgrade “all-hazards” plans that provide the framework for managing the consequences of a range of events that include both natural and man-made disasters. Most experience and evidence in delineating the role of hospitals in promoting public health security comes from the economically developed countries.4,5,6 Disasters from a management standpoint can be – fixed versus prolonged events. Hospitals and their communities must plan to create surge capacity for each of these two distinct types of events. Traditional disaster planning has largely concentrated on “fixed occurrence” events, such as those created by transportation accidents or the terrorist attacks. However, in the face of the growing threat of natural disasters and emerging infectious diseases such as “avian flu,” hospitals require to update their emergency management plans. Hospitals must be able to effectively extend their ability to deliver uninterrupted medical care in the face of a prolonged event involving large numbers of victims. The public looks to hospitals to play a critical role in the event of a disaster. A critical aspect of preparedness to the challenges of public health security is that of surge capacity. Surge capacity is a healthcare system’s ability to rapidly expand beyond normal services to meet the increased demand for qualified personnel, medical care, and public health in the event of large-scale public health emergencies or disasters and hospitals are an important component of the healthcare system, which can play a critical role in minimizing the damages as a result of public health insecurity. As such, hospitals must be to be able to accommodate the surge in demand for care in order to screen, stabilize and provide definitive care for affected persons. Hospitals can increase their patient care capacity in relatively short periods of time by “surging in place.” This involves several actions such as: (a) rapidly discharging existing patients; (b) canceling scheduled procedures; (c) taking steps to increase the number of patient care staff in the facility; (d) reconfiguring available space in a healthcare facility for use in the initial management of disaster victims; (e) extending emergency department capability by using lobby and waiting room areas, as well as other patient care.

While this type of strategy can provide for a temporary ability to increase patient care capacity, most hospitals cannot sustain such a surge for extended periods of time. Individual facilities would quickly become overwhelmed if the disaster involved large number of victims presenting over a prolonged period of time, such as would be seen in large scale event like tsunami, South Asia earthquake, pandemic influenza which would require the development of community surge capacity, involving the development of alternative care facilities. This type of community surge capacity is complicated and costly to achieve and involves advance planning for logistical support, the development of protocols, and the determination of specific mission goals. However a hospital’s ability to deliver “optimal” medical care in the setting of any threat to public health security, regardless of its cause, is in largely contingent upon a regularly available supply of key medical equipment, supplies and pharmaceuticals, as well as adequate staffing. In addition, the performance of hospitals in any disaster situation does not depend upon only the surge capacity. It also relate to the structural sustainability of the facility itself and the skill of health workforce at large specialty care givers. It has become very important to make these health facilities resilient so that they can cope through the big events both structurally and functionally. This has been one of the major challenges in developing countries, where hospitals them selves have succumbed to the damage and destruction caused by natural disasters and sometimes man-made disasters.

Hospitals in the EMR and their potential to tackle health security

According to the information available there are over 8,500 hospitals of which just over 50 percent are in the public sector (Table 1). Almost two-thirds of these hospitals are in the three countries – Egypt, Pakistan and Iran. Most large hospitals and hence hospital beds are in the public sector, the only exception being Lebanon where 90 percent of the hospital beds are in the private sector.

The critical role of hospitals in promoting public health security has been recognized in the region for some years. Although the efforts undertaken are only in their early stages of development a systematic approach is being followed. The key interventions include:

Adoption of the regional strategy and implementation of a region-wide survey for safer hospitals and health facilities in 2003

Reducing a health facility’s risk to natural hazards and emergencies has been a focus of WHO’s Eastern Mediterranean Region for several years. The regional strategy for the safer hospitals and health facilities adopted in 2003, established a regional baseline for disaster risk reduction (Box 1). Subsequently, a region wide survey was conducted to determine the level of...
emergencies that leave health services struggling to continue. The region has witnessed countless examples of disasters or emergencies that arise as a result unforeseen emergencies. The proliferation of information on health sector risk management and resiliency of hospitals and health facilities. WHO will work to raise awareness among diverse segments of the population – both within and outside the health sector – about the critical importance of this issue and/or to lobby for reducing vulnerability.

Policy changes require advocacy and outreach, which are integral components of this strategy to improve the resiliency of hospitals and health facilities. WHO will work to raise awareness among diverse segments of the population – both within and outside the health sector – about the critical importance of this issue and/or to lobby for reducing vulnerability.

Acknowledging that effective disaster preparedness is not possible without strong intra and inter-sectoral collaboration between different stakeholders, public and private, and establish partnerships and alliances with a wide variety of sectors and professions, thus bridging the gap between development and relief to reach its goal.

Information and knowledge management for individuals and sectors, thus helping to bring about change in health risk reduction and ensuring that access is widely available through different platforms and technologies.

The proliferation of information on health sector risk reduction must be catalogued, classified and transformed into guidelines and standards that promote consistent messages and sound technical practices. Best practices must be systematically collected and disseminated.

Technical support and cooperation to countries to build capacity that will reduce risk and help make health systems and the overall health network safe from disasters.

Mounting an emergency response to operationalize hospitals in the event of natural disasters and catastrophic emergencies. The region has witnessed countless examples of disasters or emergencies that leave health services struggling to continue providing medical care despite damage to health facilities. Often they are unable to function at a time when services are most needed. In a worst-case scenario, collapsed health facilities have claimed the lives of patients and health staff.

The Eastern Mediterranean Regional Office has been particularly active in helping countries operationalize hospitals or specific functions within hospitals, such as emergency services, that become disrupted in the event of any threat to public health security. The support to provided following the Earthquake in Bam in Iran in 2003 or the conflict in Lebanon in 2006 are just a few examples of such support. Box 2 provides a brief illustration of the kind of challenges to hospital infrastructure and health workers that arise as a result unforeseen emergencies.

## Hospital Safety Index

A hospital safety index has been adapted and modified based on the index developed by PAHO to assess level of preparedness of the hospitals and health facilities in regard to the resilience from disasters. The index provides opportunity to calculate the present status of the health facilities and also to identify the gaps so on the basis of which further improvement can be done to make the health facilities more resilient. Indicators have been developed against each element of the index. Indicators developed for the following elements that are being assessed to evaluate the safety of the hospitals and health facilities: (a) hazard analysis; (b) structural safety; (c) non structural safety; (d) functional safety; (e) technical safety; and (f) security.

### Box 1: Essential Elements of the Regional Framework

<table>
<thead>
<tr>
<th>Country</th>
<th>Public Hospitals</th>
<th>Private Hospitals</th>
<th>Beds per 10,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>NA</td>
<td>NA</td>
<td>4.2</td>
</tr>
<tr>
<td>Bahrain</td>
<td>9</td>
<td>8</td>
<td>27.4</td>
</tr>
<tr>
<td>Djibouti</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Egypt</td>
<td>2,288</td>
<td>2,024</td>
<td>21.0</td>
</tr>
<tr>
<td>Iran</td>
<td>398</td>
<td>119</td>
<td>17.2</td>
</tr>
<tr>
<td>Iraq</td>
<td>205</td>
<td>76</td>
<td>13.3</td>
</tr>
<tr>
<td>Japan</td>
<td>4</td>
<td>56</td>
<td>19.0</td>
</tr>
<tr>
<td>Kuwait</td>
<td>15</td>
<td>7</td>
<td>19.0</td>
</tr>
<tr>
<td>Lebanon</td>
<td>30</td>
<td>100</td>
<td>34.0</td>
</tr>
<tr>
<td>Libya</td>
<td>84</td>
<td>NA</td>
<td>37.0</td>
</tr>
<tr>
<td>Morocco</td>
<td>124</td>
<td>269</td>
<td>8.7</td>
</tr>
<tr>
<td>Oman</td>
<td>54</td>
<td>3</td>
<td>20.2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>976</td>
<td>587</td>
<td>10.0</td>
</tr>
<tr>
<td>Palestine</td>
<td>22</td>
<td>23</td>
<td>13.4</td>
</tr>
<tr>
<td>Qatar</td>
<td>9</td>
<td>23</td>
<td>25.2</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>213</td>
<td>113</td>
<td>22.0</td>
</tr>
<tr>
<td>Somalia</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Sudan</td>
<td>334</td>
<td>140</td>
<td>7.3</td>
</tr>
<tr>
<td>Syria</td>
<td>150</td>
<td>376</td>
<td>14.7</td>
</tr>
<tr>
<td>Tunisia</td>
<td>167</td>
<td>70</td>
<td>17.6</td>
</tr>
<tr>
<td>UAE</td>
<td>27</td>
<td>29</td>
<td>18.8</td>
</tr>
<tr>
<td>Yemen</td>
<td>172</td>
<td>85</td>
<td>7.0</td>
</tr>
</tbody>
</table>

*Source: Hospital (EMRO database); Bed per 10,000 population (Demographic, Social and Health Indicators of Countries of the Eastern Mediterranean; WHO-EMO3/2008; 2008)

**Table 1: Hospitals and hospital beds in the Eastern Mediterranean Region – 2005**
needs policy support to ensure political commitment and
development of a means of monitoring hospital performance
development of disaster preparedness plans by hospitals and
development of tools and instruments and their use in

Development of an e-Atlas of Disaster Risk
One of the tools being developed and refined in the EMR is an e-
Atlas of Disaster Risk, which uses geographic information systems and
various disaster models to assist disaster management
decision-makers, particularly those in the Member States of this
Region that regularly experience disasters, to reduce health risks to
vulnerable populations. This tool can help predict the
magnitude of a disaster on a specific population, assess where
damage might be the greatest and forecast specific resources that
may be required.8

Strategic directions for enhancing the role of hospitals in
ensuring public health security
Protecting critical health facilities, particularly hospitals of
disasters, is not only essential to meeting the Millennium
Development Goals but also a social and political and necessity in
its own right.9 Reducing the vulnerability of hospitals and
enhancing their role in protecting public health security is not only
possible but is critical and necessary since it is a health, social,
economic and in many instances a political issue. At the same
time healthcare providers often are being victimized by such
situations which jeopardize the public health security concern at
large.
The following broad directions are proposed for ensuring an
effective role of hospitals for protecting public health security in
countries of the Eastern Mediterranean:
First, national governments and their ministries of health should
ensure that all hospitals, especially those that are newly
constructed or are reconstructed following damage or destruction
are resilient to the risks of natural disasters. Indeed this is a cost
effective intervention, which will prevent the hospitals to stop
functioning in the event of threats to public health security and in
the long run is likely to bring health, social and economic benefits
to the country. Also it needs thorough assessment incorporating all
the relevant areas also the stakeholders.
Second, the ministries of health should ensure that the capacities of the hospitals are developed to effectively to respond in the event of disasters and emergencies. This requires several steps that include:
+ needs policy support to ensure political commitment and
  coordination among stakeholders for the overall process of
  assessment and also the development;
+ development of tools and instruments and their use in
  assessing institutional capacity to respond to emergencies as
  a means of better preparedness;
+ training and capacity development of staff to be able to
  handle such challenges effectively;
+ development of disaster preparedness plans by hospitals and
  making resources available prior to, during and following
  disasters to be able to effectively implement the plans;
+ development of a means of monitoring hospital performance
  in terms of its surge capacity in the event of threat to public
  health security;
+ creating awareness among communities and the population at
  large regarding their role and support to hospitals;

The Earthquake in Pakistan in 2005 and its consequences on
the health and hospital infrastructure
On October 8, 2005, in a matter of seconds an earthquake of the
magnitude of 7.6 on the Richter scale jolted the northern
part of Pakistan destroying 86% of the infrastructure in towns such as Balakot. Strong aftershocks threatened the structures
already damaged by the quake. More than 73,000 people lost
their lives and over 350,000 were injured. The demand for
emergency medical care was overwhelming. Almost 400
facilities, which comprised half of the health infrastructure, ranging from sophisticated hospitals to small rural clinics were
destroyed or damaged. Thirteen of the destroyed facilities were
hospitals and four of these were referral hospitals.

The need for constructing earthquake resilient hospitals was
acutely felt in such a catastrophic emergency.

The conflict in Lebanon and its effect on health workers
In September 2007, the month long conflict in Lebanon left
5,199 dead and 8,000 injured according to the Lebanese Higher
Relief Committee. Although the health and hospital
infrastructure remained largely intact, nevertheless such
facilities are more than just brick and mortar. Health workers
were overburdened, faced a highly insecure working
environment, and saw their numbers reduced as many
survivors were absent dealing with personal and family issues.

The need for specialized training to deal with non-routine
emergencies and to enhance surge capacity in such situations
became apparent.

Box 2: Challenges to hospital infrastructure and health workers
in the event of public health insecurity

+ identifying the best practices within the region that can serve
  as model for the countries having similar context. This will also
  ensure the exchange and export of required technical
  assistance to improve the system.

Third, the development partners and civil society organizations in
developing countries have a dual role to play – to help countries
to better prepare to minimize the consequences of disasters by
supporting the development of institutional capacity. And in the
event of a disaster, to better collaborate with the national
government to achieve great harmony and alignment and avoid
uncalled for duplication in supporting hospitals and health facilities
whether it relates to their reconstruction or increasing their
response capacity.20
References

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AN OVERVIEW OF REGIONAL HEALTH

ARTICLE BY DR MIRTA ROSES PERIAGO
World Health Organization Regional Director for the Regional Office for the Americas

Abstract: This article presents a summary of the 2007 edition of Health in the Americas report on health and human development in the Region of the Americas by the Regional Director of the WHO Pan American Health Organization. The full report is available at http://www.paho.org/HIA/vol2paisesing.html

Since the inception of the Pan American Health Organization in 1902, the governments of the Americas have jointly addressed their concerns regarding health and the environment, committing to collective action and defining strategies to respond to emerging challenges. From the beginning, the collection, analysis, and dissemination of health information has been a primary function of the Organization.

Starting in 1924, health conditions and trends reported by countries were a main feature of annual reports of the Director. In 1954, the Secretariat of PAHO produced the first separate report on health conditions in the Americas, thus launching an uninterrupted quadrennial, now quinquennial, publication of information on health in the Region.

This 2007 edition of Health in the Americas presents a broad picture of the regional situation and that of all the countries with regard to health and human development; specific disease conditions and risk factors; environmental health, and the evolution of health systems and services. In addition, it considers and discusses progress made regarding the global commitment, expressed in the United Nations Millennium Development Goals (MDGs), to tackle extreme poverty, hunger, disease, lack of water and sanitation, inadequate housing, and social exclusion and to promote gender equality, education, and environmental sustainability. That expression of countries’ collective commitment to social equity informs the text throughout this publication.

Health in the context of development

In the Region of the Americas, human development and health have advanced over the past quartercentury, as shown by selected indicators in Table 1. Population growth has slowed, dropping in 2006 to a rate of 1.2% per year – ranging from 0.4% in the non-Latin Caribbean to 2% in Central America. Urbanization has expanded from 68.6% in 1980 to 78.9% in 2006. Coverage of basic services is on the increase for the most part, although less so in rural areas: the general population has better access to education, water and sanitation services, primary health care, cost-effective technologies, and immunizations. This increased coverage has enabled measurable progress
toward preventing and controlling numerous communicable diseases that heretofore represented a significant burden. At the same time, life expectancy at birth has increased by an average of six years, and the incidence of infant mortality has decreased by one-half. The slowing of population growth, the lengthening of life spans, and the stemming of deaths from communicable diseases and perinatal conditions are among the foremost advances in health in the Region.

Notwithstanding these important gains in regional health, many major challenges remain: communicable diseases such as HIV/AIDS, malaria, and tuberculosis; various chronic noncommunicable diseases and conditions such as obesity, hypertension, cardiovascular diseases, diabetes, and cancer; and accidents and violence. These health problems, in turn, stem from risk factors related to various demographic, social, and economic shifts in the Americas, including the aging of the population; changes in diet and physical activity as well as the consumption of tobacco, alcohol, and drugs; and the deterioration of social structures and supports.

The Millennium Development Goals set markers of progress in terms of human development and, at the same time, are indicators of the effectiveness of health systems. Having brought investment in people's health to the core of the global development agenda, the MDGs afford new opportunities for the health sector and health organizations to gain wide support for the health agenda. The greatest share of health problems is attributable to broad social determinants – the "causes behind the causes" of ill-health: poverty, malnutrition, unemployment, lack of access to education and health services, the social exclusion of certain population groups, among others. These social determinants are analyzed in depth in Chapter 1 of this publication, "Health in the Context of Development," which covers the economic, political, social, and environmental contexts of health. Some of the salient factors impacting on health in the Americas are presented summarily in the paragraphs that follow.

Demographics

The Region of the Americas continues to experience three major demographic shifts: population growth, urbanization, and aging. Since 1950, the regional population has almost tripled, reaching 900.6 million inhabitants in 2006, according to the latest United Nations population revision. Under a mid-fertility variant scenario, this population is projected to surpass the mark of 1 billion people, more than 600 million of them in Latin America and the Caribbean, in 2016 (Figure 1). Social and economic disadvantages in rural areas and smaller population centers have led people, both worldwide and in the Americas, to migrate toward urban areas in search of employment and better living conditions, and urbanization is indeed a prominent feature of regional demographic change. Considerable differences exist among subregions, however: the urban population in the non-Latin Caribbean is 40.3%; in Central America, 54.8%; in the Latin Caribbean, 67.4%; in the Andean Area, 75.8%; in North America, 81.1%; and in the Southern Cone, 98.8%. Nearly 20% of the total population is now concentrated in only 20 of the Region's largest cities. In Latin America and the Caribbean, migration has spawned large, sprawling cities with marginalized areas that breed poverty, unemployment, violence, insecurity, pollution, and poorly distributed basic services. Since 1950, when rural population represented 58% of the total population, urban population has been growing, reaching 77.4% in 2005. If that trend persists unabated, in 2030 the urban population in Latin America and the Caribbean is projected to reach almost 85%, as shown in Figure 2.

The two population groups with the fastest growth in the Americas are the 60 and older and the 80 and older age groups. In North America, where the population-aging process began earlier, people 60 years of age and older went from representing 12.4% of the total population in 1950 to 16.7% in 2005; it is projected that this population group will increase to 20.1% of the total population in 2015 and to 27.3% in 2050. In Latin America and the Caribbean, on the other hand, the 60 and older age group comprised 5.6% of the 1950 population, increasing to 9.0% in 2005; it is projected to reach 11.3% of the total population in 2015 and 24.3% in 2050. The proportion of the total population represented by the 80 and older age group jumped from 1.1% in 1950 to 3.5% in 2005 in North America (and is projected to reach 3.7% in 2015), and from 0.4% to 1.2% in Latin America and the Caribbean (projected to increase to 1.7% in 2015). As the population ages, the ratio of productive adults to elderly individuals shrinks, as does potential funding of support for the elderly (Figure 3).

Economic growth, income and employment

The Region's economy has undergone a series of shifts from low to high growth rates. After a period of declining growth and persistent downturns in the 1980s, the countries began to experience sluggish growth – averaging around 1.4% per year in the 1990s. Between 2000 and 2003, another crisis produced a new decline in economic growth. Growth resumed in 2004,
however, reaching a regional average of 6%; in 2005, around 4%;
and in 2006, a projected 3–5.5% increase in most of the countries.
Although advances have been scored in poverty reduction in
recent years, in 2005 40.6% of the population of the Americas
(almost 213 million persons) continued to live in poverty and
16.1% (88 million persons) in extreme poverty; furthermore,
despite overall regional economic growth, the gap in wealth
between the richest and the poorest countries, far from narrowing,
widened between the late 1970s and the early 2000s – a trend
that, if current conditions persist, is projected to continue.

Unemployment precludes subscription to the social security
system and, consequently, limits access to healthcare. Informal
employment and child labor further complicate the situation.
As regards women, their entry into the paid labor force over the past
two decades, while augmenting family income and purchasing
power, has overburdened many of them, as women continue to be
the principal homemaker – a role that, paradoxically, is increasingly
neglected; yet even when they hold jobs traditionally held by men,
women tend to be paid less. As for the younger generation, the
eight MDG – the aim of which is to forge a global partnership for
development – targets the promotion of decent and productive
work for youth, whose unemployment rates in Latin America and
the Caribbean have worsened since 1995.

Education
In the Americas, progress in education has been significant over
the past quarter-century, as measured by the regional literacy
rate, which has increased from 88% in the 1980s to around 94% in
2006. Notwithstanding, educational progress has not been
uniform across all population groups: women still have lower
literacy rates than men; rural residents have lower rates than their
urban counterparts; and the poor are less literate than the rich.
Still, access to education is improving throughout Latin America
and the Caribbean, as indicated by the increase in net enrollment
in primary education for boys and girls alike, from 86% in 1990 to
95% in 2004.

Environment
Historically, human health has been shaped by the interaction of
diverse environmental, biological, economic, social, political,
cultural determinants, which can result in unsatisfactory living
conditions, environmental risks and hazards, lifestyle and
behavioral changes and, ultimately, in illness, disability, and death.
A 2004 WHO report found that, of the 102 major diseases, 85
were partially caused by exposure to environmental risks and that
environmental causes contributed to about one-fourth of disability-adjusted life years lost and one-fourth of associated
deaths.

In the Americas, socioeconomic deterioration – characterized by
poverty, rapid urbanization, and social fragmentation – has
contributed to greater inequalities and unhealthy environments,
particularly affecting rural agricultural and traditional indigenous
populations. Other environmental inequalities are observed in
marginal urban areas where housing conditions and access to
drinking water and sanitation are poor and people are more
exposed to noise, chemical contamination, and violence. These
conditions are worsening in some countries; for instance, 60% of
the urban population in Haiti had access to drinking water in 1990,
whereas by 2004 only 58% did. Chapter 3 discusses these

Globalization
The world’s increasing connectivity, integration, and inter-
dependence in the economic, social, technological, cultural,
political, and ecological spheres – a process generally referred to
as “globalization” – is one of the greatest challenges confronting
the health sector. The world’s changing economic and social
structures are imposing competitive conditions and raising the risk
of economic crises. Countries, institutions, and individuals are
having to adapt to these changes to assure their place in the local
and global scenarios. At the same time, globalization is creating
opportunities that transcend national borders. In the Americas,
this phenomenon has resulted in connectivity and collaboration
among countries, as expressed in various international summits to
advance the human condition throughout the hemisphere, and in
the formation of subregional economic blocs (Chapter 1).

Science and technology
Scientific and technological advances, industrialization,
socioeconomic development, improved communication, better
hygiene and increased food intake have contributed to increasing
life expectancy and reducing mortality rates throughout the world.
In the last 50 years many technological developments have led to
new diagnostic and therapeutic possibilities in medicine, such as
imaging technologies, materials for internal or external prosthesis, laser technology and biosensors. Vaccine research has produced numerous successes, among them vaccines for hepatitis B and Haemophilus influenzae type B as well as ongoing development of vaccines for cholera, malaria, tuberculosis, and HIV/AIDS. Many state-of-the-art technologies—such as genetic engineering, microsurgery, and custom-designed drugs—are becoming increasingly available. As a result of breakthroughs in DNA technology, specific, highly sensitive diagnostic tests have been developed for field use in tropical countries, giving rise to more precise surveillance and tracking of microorganisms and diseases. Transgenic animals are being bred to produce drugs, vaccines, hormones, and other substances of value to the pharmaceutical industry; transgenic pigs have been bred as a source of organs and tissues for transplantation, raising concerns about the possibility of the transmission of viruses or other pathogens to humans. The introduction of gene manipulation techniques has also led to bigger crop yields and better food quality, by providing resistance to pests and weeds; however, concerns that engineered organisms in nature might alter native ecosystems or even harm people’s health is resulting in demands for ethical standards for genomics, cloning, and genetic engineering.

Regional health information systems have improved significantly in recent years. Although the collection of comprehensive information about priority diseases in different geographic, demographic, and social segments of a community is difficult even in developed countries, virtually enabled advances, such as geographic information systems and collaborative work methods, are reducing the cost and improving the quality of health information.

Today the scientific and public health communities confront the challenge of making the benefits of science and technology available to the maximum number of people so as to improve, equitably, the quality of their lives. Currently, Latin America and the Caribbean trail more developed countries in the numbers of scientific and technological programmes. Research productivity in the region is still low compared to developed countries, as expressed in the fact that only 3% of the 1.1 million scientific papers included in MEDLINE during the period 2000–2003 were authored by Latin American and Caribbean investigators. One of the main constraints to the advancement of science and technology has been the low allocation of resources towards that end. As a percentage of GDP, the allocation for research and development in Latin America and the Caribbean was 0.5% in 1990 and rose to 0.6% in 2002, while in the United States the comparable allocation was about 2.6%, a proportion that remained constant throughout the period 1990–2002. Moreover, Latin America and the Caribbean have 0.7 investigators per 1,000 population as compared to the international benchmark of 6–10 per 1,000.

**Tackling the unfinished agenda**

Almost three decades have passed since the signing of the Declaration of Alma-Ata at the International Conference on Primary Health Care (Alma-Ata, Kazakhstan, September 1978), and in the Americas much progress has been made towards realizing the agenda it set forth (for more in that regard, see the section below on “Protecting Health Gains”). The countries of the

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**Figure 3: Inequalities in child survival: under-5 mortality concentration curve and index, the Americas, around 2005**

Region has placed primary health care policies and programmes at the centre of their national health systems so as to meet the goal of health for all. The number of people living in extreme poverty (less than $1 a day) fell by about 3 million from 1990 to 2005. The Region is close to achieving universal primary education — some 97% of children are completing primary school, although regional averages disguise the situation in countries that lag behind. The youth illiteracy rate has fallen by 12% in 30 years. And life expectancy is nearly 20 years longer, on average, than it was 50 years ago. Notwithstanding, work towards realization of the primary health care agenda remained unfinished at the start of the new millennium: in some countries and in many within-country areas, diseases and conditions have persisted that hamper attainment of health for all. Despite the availability of cost-effective solutions and simple interventions, a scenario of disparities prevails in which a “tyranny of averages” — that is, excessive reference to the middle value — hides the continuing presence of priority health problems. In many countries and within-country areas, the “unfinished
agenda" means the persistence of problems resolved elsewhere, including:

- Extreme poverty and hunger.
- High mortality in children under 5.
- Lack of improvement in maternal health.
- Inadequate prevention and control of HIV/AIDS, tuberculosis, and malaria.
- Limited access to essential drugs.
- Insufficient access to water and sanitation.
- Barriers to improving health of indigenous people.
- Neglected diseases in neglected populations.
- Differences in life expectancy among countries are even more
  dramatic, particularly the gap between the richest and the
  poorest, which has widened to nearly 20 years.
- Women and girls are at higher risk because they lack social security coverage in
  many countries.
- Poor health translates into grief, misery, and exposure to climatic and geographic threats. Health inequities
  in the Americas are extensive and profound, as expressed in countless examples, including among others:

  - The greatest share of maternal mortality takes place in the
    poorest countries of Latin America and the Caribbean.
  - Life expectancy at birth ranges from a minimum of 62.4 years in Central America to a maximum of 77.4 years in
  - Differences in life expectancy among countries are even more
    dramatic, particularly the gap between the richest and the
    poorest, which has widened to nearly 20 years.
  - Although women and girls have a life expectancy at birth that is on average six years greater than that of men,
    the social status of many women compromises the quality of their lives.
  - The distribution of newborns is severely unequal because
    their risk factors have further exacerbated the
    health inequities in the countries.
  - Some 218 million people are without protection against
disease risk because they lack social security coverage in
health.
  - And 100 million are without access to health services
due to geographic location, economic barriers, or the lack of
health service facilities near their homes or workplaces.

The status of women

One of the main constraints to completing the primary health care
agenda is the status of women. While women represent over two-
thirds of the labor force in Latin America and the Caribbean, their
economic advancement is curtailed because they have difficulty
securing paid jobs, earn less, are kept out of some occupations, and
work disproportionately in the informal sector. Thus, despite the
international community’s commitment to gender equality, the
lives of millions of women and girls throughout the Region are
compromised by discrimination, disempowerment, poverty, and
violence. Attainment of the third MDG – promoting gender equality
and empowering women – will reap the “double dividend” of
bettering the lives of both women and children.

The status of ethnic groups

In the Americas today, between 45 and 50 million people belong
to more than 400 unique ethnic groups – around 7% of the
regional population; 40% of the rural population in Latin America
and the Caribbean; and over 40% of the total population in Peru,
Guatemala, Bolivia, and Ecuador. The incidence of poverty is
higher among indigenous groups in the Americas, and they
experience higher levels of illiteracy, greater unemployment, and
less access to health care services – including vaccination against
preventable diseases. They suffer disproportionate rates of
maternal and infant mortality, malnutrition, and infectious diseases
(12). “In Mexico, there are an estimated 96.3 doctors per 100,000
people nationally, but only 13.8 per 100,000 in areas where
indigenous people make up 40% or more of the population”(13). One
of the principal problems for indigenous people is the lack of
official documentation. In any country, birth registration is
important because it gives an individual an official identity as a
member of society and may be needed for access to services later in
life. Latin America and the Caribbean have among the highest
rates of birth registration in the developing world: 92% in urban
areas and 80% in rural areas. But indigenous children are less
likely to be registered at birth: “in the Amazonian region of Ecuador
only 21% of under-fives have a birth certificate, compared with the
national average of 89%... [and] more than 85% of Bolivians living
in rural indigenous communities lack the official documentation
that would allow them to inherit land, register their children in
school, or vote”(14).
5, as reflected by child mortality rates, in the population of the Americas – ranked from poorest to richest according to their country’s national gross income per capita (purchasing power parity-adjusted) – shows an inequality concentration index of −0.3, which means that the poorest 20% (quintile) of the regional population concentrates almost 40% of the total number of child deaths, whereas the richest 20% accounts for only 8% of child deaths (Figure 4).

The Region of the Americas has made huge progress in reducing infant and child mortality rates. Notwithstanding the achievements in reducing mortality in the very young, differences in child mortality continue to prevail among countries as well as within them. In countries with high child mortality rates (e.g., Bolivia, Peru, Guatemala, and Brazil) but also in others with relatively low rates (e.g., Colombia and Belize), significant internal inequalities persist. Three of the many critical determinants of health inequalities among infants and children are ethnic group, geographic location, and education. In Bolivia, Ecuador, Guatemala, Mexico, and Panama, which have collected information on ethnic group and mother’s area of residence (i.e., urban vs. rural), infant mortality rates are consistently higher among rural indigenous populations than among their non-indigenous rural peers as well as among urban indigenous populations (see Chapter 2). Similarly, an analysis of inequalities in mortality of children under 5 in relation to maternal education in Bolivia, Brazil, Colombia, the Dominican Republic, Guatemala, Haiti, and Peru indicates that child mortality level and mother’s educational level are inversely related; moreover, the same analysis shows that, although overall mortality dropped greatly between the late 1980s and the early years of the present century, the size of the mortality gaps among the educational segments remained practically unchanged15.

What are the constraints that must be overcome to achieve the fourth MDG — that is, to reduce child mortality by two-thirds? Principal among them are the lack of safe water to drink, exposure to disease-bearing mosquitoes, lack of immunization, and poor nutrition. The great majority of childhood deaths could be prevented with the proven technologies of the child survival revolution – breastfeeding, vaccinations against the main childhood diseases, clean water sources, oral rehydration therapy,
and bed nets to prevent malaria. In fact, the interventions needed to prevent and treat the causes of death in children that could lead to a two-thirds reduction in child mortality are available, "but they are not being delivered to the mothers and children who need them"18.

The children most at risk are those in the poorest countries and in the most deprived communities within countries; those who are discriminated against because of gender, race, or ethnicity; those affected by HIV/AIDS; those lacking good nutrition; those who have been orphaned, many as a result of AIDS, and end up responsible for themselves and often for their siblings; those subjected to violence, abuse, or exploitation; those who have to work for a living; and, in general, those who lack access to essential goods and services. For instance, in Latin America and the Caribbean in 2003, of all children under age 18, 6.2% were orphans; and, during the period 1999–2004, 8% of females and 11% of males in the 5–14 year age group were involved in child labor. The persistence of inequalities in health are further confirmed by the ranking of perinatal disorders and malnutrition among the 10 leading causes of death in several Latin American countries and in subnational areas of others – information that reflects a high proportion of childhood deaths, as most occur in the first years of life.

Maternal health. Many public health scholars consider that, in addition to life expectancy, a country’s health status can best be judged by its maternal survival ‘marker’: “if the maternal mortality rate drops, it can be assumed that a population’s other health problems are also improving; if, on the other hand, maternal mortality remains the same, other attempts to improve the population’s health will ultimately have little effect on its wellbeing”19.

Each year, more than 22,000 women in Latin America and the Caribbean die from complications of pregnancy and childbirth. Most of those deaths would be preventable if appropriate interventions and care were available throughout pregnancy, childbirth, and the postnatal period18. And, although maternal interventions and care were available throughout pregnancy, Caribbean die from complications of pregnancy and childbirth. The Americas still experience one maternal death in 2,000 live births. Over 95% of maternal deaths occur in rural, peripheral areas, and the rate is highest in the poorest countries. In 2005, the maternal mortality rate was highest in Pakistan, followed by Bangladesh and Ethiopia (Figure 6). Furthermore, 90% of maternal deaths occur in hospitals and clinics, but only 40% of women with complications are taken to a facility. The primary cause of obstetric deaths is hemorrhage, and 90% of these deaths result from lack of blood transfusions. Despite the availability of technologies and procedures to prevent bleeding, many women have no access to the interventions needed to survive obstetric complications. In Latin America, maternal mortality is highest in the rural areas and in the poorest communities. Since maternal deaths account for half of all deaths among women of reproductive age, efforts to reduce maternal mortality have a significant impact on women’s health and survival.”

Preventing and controlling local endemic diseases. Despite a reduction in its incidence, malaria, a disease that is preventable, continues to constitute a significant public health problem. More than one million people – mostly children under 5 – die each year from the disease, and in the Americas, malaria is the cause of 0.4% of deaths among children under 5. Malaria transmission still occurs in 21 countries of the Americas, and an estimated 250 million people live in zones at risk for transmission. Of the approximately one million cases reported annually, three-fourths are caused by the principal parasite, Plasmodium vivax.

In recent years, dengue has been on the rise, increasing from almost 400,000 cases in 1984 to over 430,000 cases in 2006. Carried by the Aedes aegypti mosquito, dengue flourishes in areas with poor sanitation and high precipitation; there is no vaccine or cure for the disease. The disease is very difficult to control, and its spread is enhanced by conditions that promote human mobility. In recent years, dengue has been on the rise, increasing from almost 400,000 cases in 1984 to over 430,000 cases in 2006. In recent years, dengue has been on the rise, increasing from almost 400,000 cases in 1984 to over 430,000 cases in 2006. In recent years, dengue has been on the rise, increasing from almost 400,000 cases in 1984 to over 430,000 cases in 2006.

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Bolivia stepped up prevention in border areas, including intensified surveillance and control measures. An ongoing health priority throughout the Americas, tuberculosis affects over 350,000 people, and 50,000 die of the disease every year. The regional disease rate was 26.8 per 100,000 in 2004, with Latin Caribbean and Andean Area countries reporting rates as high as 61.5 and 55.5 per 100,000, respectively. This situation is aggravated by TB/HIV coinfection and the resistance of tuberculosis to multidrug therapy, which jeopardizes attempts to control the disease throughout the Region.

The so-called neglected tropical diseases – which can cause excruciating pain, disfigurement, and disability – vary in distribution, but are directly associated with poverty, malnutrition, lack of schooling, and unemployment. Their burden is substantial among the 566 million people living in Latin America and the Caribbean, where the estimated currently infected populations (and, where relevant, the percentage of the total population in 2003) are, respectively:

- Chagas’ disease: 18 million (3.2%).
- Trichuriasis: 99 million (17.6%).
- Ascariasis: 82 million (14.6%).
- Schistosomiasis: 3 million cases in Brazil (1.6% of the country’s total population).
- Leptospirosis: 80,602 cases.
- Hookworm infection: 34 million (6%).
- Leprosy: 80,602 cases.
- Onchocerciasis: 63 new cases reported in 2004 from Colombia, Ecuador, Mexico, and Guatemala combined (0.3%).
- Lymphatic filariasis: 720,000 cases, principally in Haiti (8.4% of the country’s total population).
- Trachoma: of 150,000 cases examined in Brazil in 2004–2000, 10,000 were found to be positive.

Lack of routine epidemiological surveillance and data collection for the neglected diseases in almost all countries in Latin America and the Caribbean makes it difficult to accurately estimate disease burden, with the exception of leprosy.

Safe water and basic sanitation. Availability of drinking water has improved in the Americas since 1990, but that improvement has not grown at an even pace throughout the hemisphere. By 2002, 93% of the population in the Americas used improved sources of drinking water, while coverage in the North American region (the United States and Canada) was 100%, in Central America was 85%, and within that subregion, in Guatemala the proportion of the population using improved sources of drinking water was only 75%. The differences are greater between urban and rural populations. In Brazil, for example, the proportion of the urban population using improved sources of drinking water reaches 96%, while the rural population having service is only 56%. Basic sanitation services reach even less of the regional population, 84%, and in addition to the marked differences between urban and rural access, the total urban and rural coverage in Central America and the Latin Caribbean is much lower relative to other subregions – 63% and 66%, respectively (Figure 7). The situation is critical in rural areas of a few countries like Guatemala, Belize, Haiti, and Bolivia, where coverage of improved sanitation facilities in rural areas is between 17% and 23%. The relationship between coverage of water and sanitation services and levels of health and human development is described in Chapter 3. Among other examples of that relationship, the regional child mortality rate due to diarrheal diseases was 3.7% and as high as 7.6% in the Andean subregion in 2000–2005.

In summary, while great advances are underway in science and technology, host all-of-public health is being transformed. A gap still exists between the targeted (2015) and recent (2005) rates of reduction in child mortality, while within each country there are further gaps in the rates. Although progress has been extraordinary – diseases have been eradicated or eliminated and the public health infrastructure has been strengthened – it has been uneven. Some countries still have a significant proportion of their populations living in districts where vaccination coverage remains below 95%. Sporadic outbreaks of diphtheria and pertussis still occur because of an accumulation of susceptibles missed by routine national programs. This accumulation also puts countries at risk for large measles outbreaks when importations of the measles virus occur, as recently happened in Venezuela (2001–2002), Colombia (2002), and Mexico (2003–2004). Thus, although progress has been scored toward attainment of the goal of health for all, the agenda remains unfinished.

References

11. Ibid. p. 89.
Patient safety is gaining a foothold in South-East Asia

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Abstract: In the 2006/2007 edition of the IHF Reference Book, we described the scope and context of patient safety in WHO’s South-East Asia Region1,2. The current paper, written two years after the adoption of resolution SEA/RC59/R3 on “Promoting Patient Safety in Health Care”3, describes how patient safety is fast becoming a key driver for quality in health care in the Region.

Two years ago, discussions on patient safety in the Region were largely limited to concerns about drug safety, blood safety, injection safety and healthcare waste management. The discipline of patient safety, and its role in minimizing the incidence and impact of adverse events, and maximizing recovery from them, were practically unknown except in small healthcare quality circles. Today, the “science” of patient safety is better understood and discussions about patient safety are more likely to be about system design, organization and operation.

Patient safety is gaining prominence on the agenda of important conferences

Today patient safety appears on the agenda of high-profile conferences and, in some cases, entire sessions are dedicated to the topic. For instance, the All India Institute of Medical Sciences (AIIMS), India’s premier medical teaching, research and health services institution, is dedicating a full day to patient safety at its South Asian Conference & Continuing Medical Education on Synergy in Healthcare in 2008 (SASHCON 2008). The four-day event attracts over 500 senior hospital executives and administrators from across the country as well as neighbouring countries.

The Indian Health Care Quality Forum (IHQF), a non-profit organization which promotes concepts of quality management in health care in India, selected “Enabling Safety in Health Care Organizations” as the theme of its annual International Healthcare Quality Conclave for 2008. The IHQF also launched the “Partners in Safety” campaign which aims to promote collaboration among health-care institutions in the country through the exchange of experience and the publication of booklets on various aspects of safety.

Similarly, patient safety is highlighted in the agenda and keynote speeches at the First International Conference on Health Promotion and Quality in Health Services (HPQS), which is being organized by the Institute of Hospital Quality Improvement and Accreditation together with the Ministry of Public Health and the Medical Association of Thailand.

Patients are getting involved

In a move to diffuse the increasingly confrontational nature of the doctor-patient relationship, WHO brought together in open dialogue a self-selected group of patients and caregivers (many of whom had been affected by unintended medical harm) with physicians, policy-makers, lawyers and the media1. Consumers and health-care providers who only months earlier were blaming each other in the media, were sitting side-by-side discussing how to work together to make health care safer in their respective countries. Together with representatives of non-governmental organizations, nursing and medical councils, and professional associations, they drafted the “Jakarta Declaration on Patients for Patient Safety in Countries of the South-East Asia Region”. The Declaration calls for open and honest communication between patients and health-care professionals and a healthcare system in which “no patient should suffer preventable harm”2.

The Jakarta Declaration is helping to pave the way for collaborative associations between patients and health systems. In Sri Lanka, for example, patients partnered with the College of General Practitioners to organize a Patient Safety Symposium at the annual meeting of the Sri Lanka Medical Association in 2007, and are currently collaborating on the development of educational posters on patients’ rights and responsibilities.

In Indonesia, two patient representatives have joined the Indonesian Hospital Patient Safety Committee (IHPSC), which was created a few years ago by the Indonesian Hospital Association with the support of the Indonesian Ministry of Health. In addition, the Jakarta Declaration has been included in the new edition of the Indonesian “National Hospital Patient Safety Guidelines”, which will be distributed to the 800 participants attending the Annual
Patient Safety Seminar in Jakarta late in 2008. In Thailand, patient and consumer groups have worked with the Ministry of Health and the Thai Medical Council on a no-fault compensation act, which was passed by the Thai Cabinet earlier this year and has yet to be ratified by the Parliament.

Medical councils are playing a leadership role

Patients were also represented at the First Meeting of the Regional Network of Medical Councils which was held in Colombo, Sri Lanka, in 2007 to discuss the roles and responsibilities of medical councils in ensuring patient safety. Three priority areas for action were identified:

- Restoring public trust;
- Improving accountability and oversight mechanisms;
- Integrating patient safety concepts and practices into education, training and induction schemes.

Recommendations of the network are summarized in Box 1.

Governments are recognizing the crucial role of hand hygiene in the prevention of health care-associated infection

Bangladesh, India, Indonesia and Thailand signed pledges to address healthcare-associated infection under the first Global Patient Safety Challenge “Clean Care is Safer Care”. The introduction of alcohol-based handrub to the Region has been a critical intervention in a region where access to clean water, soap and towels is a huge barrier to hand hygiene.

Bangladesh is now manufacturing its own alcohol-based handrub based on the WHO formulation and is field testing the WHO Guidelines on Hand Hygiene in Health Care in several wards of the 1000 bed Chittagong Medical College (CMC). The introduction of the hand hygiene guidelines at CMC is proving to be a starting point for other infection control improvements in the hospital, such as sanitation and waste management. Furthermore, the Government of Bangladesh has earmarked funds to roll out the intervention across the country.

Similarly, the Government of Maldives launched a national hand hygiene campaign in 2008 as a first step toward implementing the WHO hand hygiene guidelines at the Indira Gandhi Memorial Hospital, the central referral hospital in Male, as well as six regional hospitals across the atolls. The Ministry has budgeted for the procurement of alcohol-based handrub in all hospitals in the coming year.

Acceptance of safe surgical care practice standards is growing (good start)

As in other parts of the developing world, unsafe surgery accounts for at least half of preventable adverse events resulting in death or disability in the Region. St. Stephen’s hospital in Delhi, India, was one of eight pilot sites across the world to test the WHO Surgical Safety Checklist which was developed under the second Global Patient Safety Challenge “Safe Surgery Saves Lives”. The checklist consists of a set of basic tasks that need to be completed or confirmed during the preoperative, perioperative and immediate postoperative periods to ensure the prevention of surgical site infections, safe anaesthesia, and effective communication and teamwork among members of the surgical team.

As part of their new Patient Safety Initiative, AIIMS introduced the checklist into all the operating rooms of their cardiothoracic specialty center. While data analysis is still ongoing, acceptance of the checklist by the surgical team is reported to be high and there have been no reported cases of wrong-patient, wrong-procedure or wrong-site errors since the introduction of the checklist in April 2008.

Accreditation of healthcare facilities is gaining momentum and providing an entry point for patient safety

The issue of external oversight mechanisms such as accreditation was discussed by experts from India, Indonesia, Sri Lanka and Thailand. All agreed that a hospital accreditation process based on uniform standards should be introduced into the Region and phased in according to the needs and resources of individual member countries. Furthermore, there was consensus that accreditation offer a means to introduce patient safety goals into health care facilities in the region. Indonesia, Thailand and India – the only countries in the Region that have national health care accreditation bodies – have integrated patient safety goals into their hospital quality standards.

Medical tourism has been an important driver for seeking hospital accreditation and it is no surprise that accreditation has been sought primarily in the private sector. It is therefore a significant development that state governments are seeking accreditation of public hospitals for the first time in India with financial assistance from the National Rural Health Mission (NRHM). In Gujarat, for example, 8 district hospitals have received
accreditation by the National Accreditation Board for Hospital and Healthcare Service Providers (NABH) under the Quality Council of India (QCI), and the remaining 17 are expected to be accredited by 2010. In Tamil Nadu, 12 district hospitals are in the process of obtaining NABH accreditation and more will follow in the years to come.

Educating healthcare providers in the science of patient safety

WHO is collaborating with the Indira Gandhi National Open University (IGNOU) in Delhi on a patient safety curriculum for medical officers. The course was commissioned by the Directorate of Health Services for in-service training of medical officers. It is anticipated that the course will eventually be offered to students across India and beyond as a long-distance education course.

Conclusion

Patient safety is increasingly being recognized as a critical dimension of quality in healthcare in the Region as reflected at regional health care quality conferences. Notions of patient safety have evolved from a focus on the safety of products and procedures to the safe delivery of those products and services. Patients and caregivers are building partnerships with providers and policy-makers, and demonstrating how they can be part of the patient safety solution rather than the problem. In so doing, patients are also helping to overcome the culture of silence and blame that prevails in the Region. Medical councils have recognized patient safety as integral to their mandate of protecting the health of the public and are poised to improve oversight and accountability mechanisms in order to regain the public’s trust. Accreditation is proving to be an effective mechanism for introducing patient safety goals in healthcare facilities. Furthermore, safety can be enhanced even where resources are limited, as has been demonstrated in the accreditation of public hospitals in Gujarat. Successful implementation of relatively simple interventions such as hand hygiene and the introduction of clinical checklists can serve as catalysts for future and more complex interventions. And finally, the first steps to integrating patient safety concepts into pre-service and in-service health professional education and training have been initiated.

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Built to an open architecture, our multipurpose archive – Hitachi Content Archiving Platform — stores data so that it will be retrievable, despite technology refreshes, well into the future. With some clinical data required by law to be retained for many years, this is of key importance. Data integrity is maintained at standards with compliance a major issue for healthcare organisations, the protected data at the application level, HCAP will stop it from being deleted at the physical storage level.

In some countries data must be irretrievably destroyed in certain purposes, irretrievable.

Secure backup is critical. One of the consequences of the Hurricane Katrina disaster was the loss of the medical records of hundreds of thousands of people, many of whom were taking treatment where it might be critical for their future wellbeing that details such as radiation doses given were known accurately. Perhaps the circumstances were exceptional but it seems clear that failure to secure and backup records properly were among the many other administrative failures. Add in the importance of data integrity – you don’t really want important information to be modified arbitrarily – and it’s clear that protecting data from loss, change and illicit access is a vital element in managing medical information.

“Ultimately it’s about having the correct infrastructure in place,” says Clark. “Hospitals are increasingly investing in open standards based infrastructure. This enables scalability, flexibility to change and brings freedom of choice. You can mix clinical and non-clinical information, images from different departments and different modalities, and bring together heterogeneous information silos, but still make them easily and quickly available by using controller based virtualisation because latency is kept to a minimum. It’s really about improving efficiencies, reducing cost and ultimately making things better not only for the medical staff but also for the patients.”

Ready for the revolution? The healthcare sector is undergoing an IT revolution. Data is its lifeblood, but hospitals and other substantial healthcare organisations have traditionally purchased IT from various vendors at the departmental level; that has meant enormous difficulties in sharing data between departments. Since such data sharing is fundamental to efficient operation and effective patient care, hospitals and national health systems are now investing primarily in open infrastructure to support it.

The problem of fragmented data For decades, hospitals’ IT communities have suffered from highly fragmented data. With individual departments managing their own IT, a plethora of incompatible systems have arisen. This has made it exceedingly difficult for all the information pertaining to any given situation to be gathered together where and when it is needed. For example, discharging a patient requires the gathering together of a wide range of clinical and non-clinical data, including laboratory and pharmacy data, doctors’ notes and a range of administrative information. With different data types being held on separate systems, collating all of the required information is a significant task.

The solution: a virtualised multipurpose infrastructure The Health Care industry’s data storage needs are increasing rapidly. Safe storage is critical and clinicians need access to medical data from many locations. Data structure incompatibilities between clinical modalities introduce further problems.

So much data, so little time! The pursuit of quality patient care, improved workflow and ultimately centralised patient records involves having clinical and non-clinical information available at the point of care. To achieve this, the right infrastructure needs to be deployed to facilitate information sharing.

Getting the infrastructure right The output from specialist imaging devices such as CT or MRI scanners or even simple X-rays can generate substantial files. Further, medical records need to be retained for a patient’s lifetime and with increasing aging and chronic conditions storage needs can be significant. Nor is medically-related data normally neatly filed away and accessible. Different departments will hold specific information relating to particular patients and there can often be relevant non-clinical information, email comments from one physician to another or perhaps older paper documents which are still current.

Although an electronic patient medical record itself might be a small document, attached diagnostic and other information can greatly increase data storage needs. “Islands of information still prevail in a typical hospital,” says Mark Clark, director of healthcare at EMEA, Hitachi Data Systems. “Consolidating that fragmented data into a more manageable and accessible source brings considerable benefits, both for hospital efficiency and patient waiting times. This needs the correct information infrastructure, however, and that’s our area of focus.”

Rapid access to information Large file sizes and slow or busy networks can also impact on how quickly data can get to where it’s needed. In the past it might have taken a week to order X-ray plates for a patient’s visit but clinicians now expect images to be available instantly wherever, on whatever workstation they’re using.

“We can get full fidelity images of any kind to a clinician in seconds by using efficient pixel streaming techniques,” explains Clark. This is particularly useful where small bandwidth networks or the internet itself are involved and gives much greater flexibility of location. This improves workflow and the diagnostic process and helps bring the health community closer together. Ultimately, this is better for the patient.”

Ready for the revolution? The healthcare sector is undergoing an IT revolution. Data is its lifeblood, but hospitals and other substantial healthcare organisations have traditionally purchased IT from various vendors at the departmental level; that has meant enormous difficulties in sharing data between departments. Since such data sharing is fundamental to efficient operation and effective patient care, hospitals and national health systems are now investing primarily in open infrastructure to support it.

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The solution: a virtualised multipurpose infrastructure Hitachi Data Systems addresses all of these challenges, and more. We can share, manage and protect all kinds of digital information, including clinical and non-clinical, fixed content and transactional data. Interfacing via industry-standard communications protocols, we are able to handle data from disparate sources, and make it available when and where it is needed.

Hitachi Content Archiving Platform — stores data so that it will be retrievable, despite technology refreshes, well into the future. With some clinical data required by law to be retained for many years, this is of key importance. Data integrity is maintained at standards demanded by courts of law, providing protection for the organisation in cases of legal challenge, and minimising the occurrence of diagnostic and prescription errors.

With compliance a major issue for healthcare organisations, the ability to set up policies in HCAP is an important feature. Where data must be retained for a set period, a policy can be set up accordingly. Once the policy is set up, if a user attempts to delete protected data at the application level, HCAP will stop it from being deleted at the physical storage level.

In some countries data must be irretrievably destroyed in certain circumstances. HCAP provides the ability to electronically shred such data at the physical storage level, making it, for all practical purposes, irretrievable.

We’re ready HCAP is a remarkably powerful solution. Protecting and securing content, and with the ability to grow with the organisation, it saves time and money and supports regulatory and corporate governance requirements. It will deliver significant value in organisations such as regional hospital networks, medium-to-large hospitals and regional and national bodies.

In today’s healthcare environment it’s all about data. In fact the PACS concept is now moving quite rapidly through cardiology, pathology, endoscopy and many other image centric disciplines. Once any institution has made the decision to go digital it is only a matter of time before they begin to want the “asset” or image or report to make its way through the healthcare workflow process.

Once any institution has made the decision to go digital it is only a matter of time before they begin to want the “asset” or image or report to make its way through the healthcare workflow process. While standards like DICOM, HL7 and XDS have helped to promote more processes and collaboration with respect to patient data, the next evolution will be with hospitals and national health systems investing in infrastructure so that they can leverage the market for applications without being locked in to any specific vendor. In many of the cost saving and efficiency initiatives it is the infrastructure that is being hugely contemplated and contested and not the application. Governments are investing millions of Euros in national projects and infrastructure will be key to the success of these projects.

Simply put, invest in infrastructure and applications can become modular. Connected systems can all be best of breed and, if you have a stable and thought-out infrastructure plan, Hitachi can help to facilitate data sharing and improve workflow through the HealthXchange, a fully integrated grid based component of HCAP where all clinical and non-clinical information can be managed, shared and protected across the organisation ultimately providing information where it is needed at the point of care.

Once the information is available then it can be mined to facilitate knowledge and ultimately decision making.
Abstract: While clinical practice focuses on treating illness, there’s also a raft of research to suggest that the quality of our everyday surroundings has a highly important role to play in sustaining wellness. This article considers the advantages of a salutogenic approach to hospital environments which focus on the factors that keep us well and stimulate the mind.

Architecture and design have been influenced by industrial societies for decades, and as a result, public buildings such as airports and hospitals have often been designed to function and look like factories. Clinical practice in hospitals focusses mainly on treating illness while often neglecting a patient's psychological, social and spiritual needs. Environmental qualities that could be considered as psychosocially supportive have not been developed properly. Psychosocially supportive design stimulates and engages people, both mentally and socially, and supports an individual’s sense of coherence.

The basic function of psychosocially supportive design is to start a mental process by attracting human attention, which may reduce anxiety and promote positive psychological emotions. Health processes could be strengthened and promoted by implementing design that is salutogenic – ie, that focuses on the factors that keep us well, rather than those that make us unwell. The aim of psychosocially supportive design is to stimulate the mind in order to create pleasure, creativity, satisfaction and enjoyment. There is an important relationship between an individual’s sense of coherence and the characteristics of the physical environment.

In this literature review we have studied more than 300 articles as well as other literature that had relevant connection to the field of physical environment, health and behaviour, to shed light on psychosocially supportive design.

Theories and perspectives on health
Health is difficult to define, since it is a subjectively experienced condition. It is affected by norms and expectations and is also formed by previous experiences. There are a few different definitions of health. For example, Lawrence has defined health as a condition where resources are developed in the relationship between humans and their biological, chemical, physical and social environment.
Antonovsky believes that a person’s sense of meaningfulness is not perceived as socially constructed (ibid.). Heiman showed that students with a high sense of coherence did not experience high levels of stress. The research also showed that coping strategies were significantly correlated with the individual’s sense of coherence (ibid.).

Research has shown that it is possible to measure a person’s sense of coherence and thereby predict an individual’s health (ibid.). A strong sense of coherence predicts good health, and a low sense of coherence predicts poor health (ibid.). In his study, Heiman showed that students with a high sense of coherence did not experience high levels of stress. The research also showed that coping strategies were significantly correlated with the individual’s sense of coherence (ibid.).

The concept of sense of coherence has three vital components: (1) comprehensibility, (2) manageability, and (3) meaningfulness. A person with a strong sense of coherence scores high on all three components. According to Antonovsky, the term comprehensibility implies that the individual perceives the surrounding environment as coherent. If something unexpected is happening, such as an accident or personal failure, the person who understands why they are happening has a higher sense of coherence than one who cannot. A person with a low sense of coherence perceives himself as unlucky.

Manageability means that the individual experiences that she is disposed of all the required resources necessary to cope with a given challenge or demand. This means that the individual feels that she is influencing that which is happening around her and does not perceive herself as a victim of circumstance (ibid.). Antonovsky believes that a person’s sense of meaningfulness is connected to his or her perception that there are important and meaningful phenomena in life. Meaningfulness is the component that motivates a person’s sense of coherence.

The physical environment

There is an interaction between humans and the physical environment. According to Antonovsky, the physical environment is not only vital for good health, but can also be a critical stressor for the individual. Physical elements in an organization can contribute to stress and are therefore essential factors for increasing comfort (ibid.). Despite that, the majority of humans in the western world spend most of their time in indoor environments; there is a lack of knowledge about how these environments affect a person’s health and wellbeing (ibid.). There is a general belief that humans are always adapting to the environment (ibid.).

In order to create supportive physical environments it is crucial to understand an individual’s fundamental needs (ibid.). It is also necessary for different professional disciplines to willingly cooperate in creating the best conditions for humans (ibid.). Before a zoo is built, it is common practice for architects, designers, biologists, landscape architects, animal psychologists and building specialists to collaborate in creating an environment that optimises the living conditions for the animals (ibid.). Factors such as materials, vegetation and lighting are taken into consideration; animals need enough space to eat, sleep and decide when to be social or seek solitude, and even their need for control and choice have been noticed. The aim is to create an environment that will support the animal’s physical, psychological and social wellbeing. Ironically, humans do not seem to make the same demands when a workplace is going to be designed (ibid.).

Heerwagen et al., created a framework and guideline for a salutogenic design, which highlighted the following factors: (1) Social cohesion, both formal and informal meeting points; (2) personal control for regulating lighting, daylight, sound, temperature, and access to private rooms; (3) restoration and relaxation with quiet rooms, soft lighting, access to nature and a good view. Stokols has also contributed with design suggestions for health-promoting environments that stem from three different dimensions of health: physical, mental, and social. Physical health can be promoted by an ergonomic design with non-toxic environments. Mental health can be promoted by personal control and predictability as well as aesthetic, symbolic and spiritual elements. Social health can be promoted by access to a social support network, and participation in the design process.

It is not a new idea to view the physical environment as a health-promoting factor. During the nineteenth century, Florence Nightingale developed a theory of healthcare that emphasised that physical elements are vital for the individuals’ health (ibid.). Examples of physical elements, such as noise, illumination and daylight were considered vital factors for a person’s mood (ibid.).

Levi founded the stress theory model, which was later developed by Kagan and Levi (ibid.). The model is based on a system that points to a deeper understanding between the physical environment and different human components. According to Dilani, the model describes how the physical environment is the foundation on which societal organisation is built and, in the long run, promotes health or disease. The model is used within the field of architecture to integrate design elements with health and wellbeing (ibid.).

Emdad has recently developed a model called Instability of...
Social support and the physical environment

Social support is an important factor when the aim is to promote an individual’s health and well-being. The knowledge and consciousness of social support and its relation to health increased in the 1950s. At the same time, researchers established that the physical environment and how it influences people’s emotions, behaviours and motivation are important to take into consideration when the aim is to promote health and well-being. It is therefore essential to identify factors in the physical environment and, through design and architecture, create meeting points that can promote spontaneous social interaction and social support. For example, research has shown that a certain length and layout of student dormitories can increase the number of social activities and promote social interaction, create a higher sense of control and reduce a sense of crowding.

Crowding

Crowding is closely linked to social support and is often defined as the number of persons in a certain area or how much space every individual has received in a certain area. Altman describes crowding as a condition where a person’s private sphere is trespassed. If there is too much undesirable contact, an individual may experience a sense of crowding. On the other hand, if an individual experiences too little contact, there is a risk that he or she may feel lonely and isolated. This balance between social interaction and desired loneliness can, according to Maxwell, be regulated and achieved if one can control his or her own levels of social interaction.

Nature and its meaning for health

Most people have some kind of relationship to nature and there are many people who greatly value diverse natural environments. Also, there are many people who want to get away from everyday life during weekends and holidays, and regain their strength in relaxing and natural recreational areas. What is it that makes people feel at ease in nature? Does the natural environment affect people in different ways? Is it possible to draw any general conclusions about nature’s influence on the human being?

Kaplan and Kaplan have developed the Attentional Restorative Theory (ART), which identifies two attention systems – direct and indirect attention – and how they are related. Indirect attention does not demand any energy or effort from the person and it is activated when something exciting suddenly happens or when one does not have to focus on something in particular. Direct attention is activated as soon as a person needs to concentrate and focus on a task and simultaneously block other disturbing stimuli. After an intense period of direct attention, a person is in need of restoration; otherwise she will easily become mentally exhausted. People who have been using their direct attention without resting often become impatient and irritated and it has been shown that a mentally exhausted person often commits so-called “human errors”.

The restorative environment should be inviting, well-balanced with aesthetic beauty, and allow people to reflect. Nature, with its colours, forms and scents, is unparalleled in encouraging people to forget about their everyday life. It is therefore very important that natural environments are accessible at the workplace.

These studies have been able to distinguish the following four needs when individuals are in need of restoration and recreation: (1) The need for being away from everyday life and its surrounding sounds, routines, crowding, etc.; (2) The need for fascinating stimuli that effortlessly stimulate the individual, and diminish the risk of becoming bored; (3) The need for extent, which at the same time can create a feeling of being in a completely different world; (4) The need for compatibility while performing one’s tasks.

The restorative environment should be inviting, well-balanced with aesthetic beauty, and allow people to reflect. Nature, with its colours, forms and scents, is unparalleled in encouraging people to forget about their everyday life. It is therefore very important that natural environments are accessible at the workplace. The ART has been tested and confirmed by different researchers. For example, one of the studies showed that three of the four components – being measurable indicators of how to create a restorative environment.
According to Van den Berg, Hartig and Staats\(^4\), several studies have confirmed that human beings perceive natural environments as more restorative than urban environments. Therefore, when human beings are tired and mentally exhausted, nature is the appropriate place for restoration. Other studies have shown that viewing nature through a window has positive health outcomes\(^3\, 37, 38, 39\).

### Daylight, windows and lighting

There is a great deal of research on daylight’s positive effects on humans’ psychological wellbeing\(^2\). A lack of daylight can lead to both physiological and psychological difficulties\(^2\). Research has also shown that daylight in a classroom is necessary for the pupils to maintain a balanced hormone level\(^2\). It is also shown that a window can have positive health outcomes on patients \(^4\, 5\). The window can contribute by allowing fresh air and daylight to enter as well as providing a view. It can also be the link to the outer world – thus satisfying a patient’s or prisoner’s need for viewing the season’s variations, etc. (ibid.). Another study showed that exposure to direct sunlight via windows at the workplace increased workers’ wellbeing and had a positive impact on their attitudes and job satisfaction\(^3\).

Research has shown that illumination can have an impact on factors in daily life, such as sleep and work performance. For example, Lack and Wright\(^44\) showed that exposure to lighting at certain times during a 24-hour period can prolong sleep and improve the quality of sleep. Energy consumption and costs can decrease if the individual has the ability to control the illumination levels (ibid.), which also has positive affects on environmental resources\(^5\). Research also showed that an individual’s general satisfaction was higher when they had the ability to control the lighting levels themselves (ibid.). Küller\(^46\) concludes that lighting will become more important in the future, especially since it is pronounced effect on worker performance and in the long run affects the organisation’s productivity.

Furthermore, the physical work environment’s design has a pronounced effect on worker performance and in the long run affects the organisation’s productivity. Physical, psychological and functional comfort can have positive outcomes on employee performance and morale (ibid.). Taylor\(^52\) uses the concept of therapeutic design. He maintains that a well-designed physical environment within the hospital can positively affect the rehabilitation process. An inviting lobby or reception area may decrease anxiety (ibid.)

Edvardsson’s research\(^53\) showed that healthcare environments that are welcoming, inviting, enriched by beautiful objects and that create space for social meetings, affect patients by making them

![Image](https://example.com/image.png)
more receptive to rehabilitation. The research also showed that it was easier for patients, visitors, relatives and personnel to relax, follow their own rhythm and feel secure and safe in these kinds of settings.

Other factors for wellbeing are, according to Dilani\(^{54,55}\), landmarks in buildings. These landmarks are closely related to the perception of stress\(^{54}\) seeing as these landmarks can serve as reference points in the buildings for easy orientation and creating our cognitive maps of the environment\(^{54,55}\). These landmarks could be objects such as sculptures, paintings, aquarium or different colours in different rooms.

**Sound, music and health**

The experience of sound is highly individual\(^{56}\) and Kryter\(^{57}\) describes that there are three variables that affect an individual’s sound experience: volume, predictability and possibilities for control.

Studies have shown that noise can lead to physiological, psychological and social health consequences. Noise is a regular factor in the physical environment, which can contribute to stressful experiences\(^{58}\) and irritation, which can lead to stress and cause stress related diseases\(^{58}\).

Leather, Beale and Sullivan\(^{59}\) have shown that noise can have a significant relation to working demands, where workers’ perception of work stress decreases with lower noise levels. Leather et al\(^{59}\) explain that workers in a less noisy environment possibly need fewer coping strategies for adapting to the physical environment and can therefore focus their energy and coping strategies on other stressful events. In that way, the physical auditory environment can be a vital factor in helping individuals cope with other stressors (ibid.).

Lang, Fourniaud and Jaquetin-Salord\(^{60}\) and Evans, Bullinger and Hygge\(^{61}\) proved that noise can increase an individual’s blood pressure, and other researchers\(^{62}\) showed that noise can increase cortisol levels. Research has also shown that noise can negatively influence the healing process\(^{63}\). Noise can contribute to mental exhaustion, which in turn can affect the amount of medication that a patient takes\(^{64}\). Investigations have also established the connections between noise, irritation and lack of concentration\(^{65}\). Finally, other studies indicate that the perception of life quality decreases in a noisy environment\(^{66}\) and that high noise levels can also inhibit social interaction\(^{67}\).

There are sounds that promote health and Lai, Chen, Chang, Heat, Huang, Chang and Peng\(^{68}\) maintain that music can promote health, since it may contribute to a decreased activation in the sympathetic nervous system. Music may also lead to lower heart and breathing frequencies, and increase body temperature (ibid.). Lee, Chung, Chih and Chari\(^{69}\) conclude that music can be an efficient method for decreasing negative physiological affects when people are suffering form anxiety and stress. Music, or music in combination with therapeutic treatment, can improve a patient’s rehabilitation process\(^{70}\). McCaffrey and Good\(^{71}\) showed that patients who listened to music after surgery experienced less pain, anxiety and fear than those who did not. The patients claimed that, instead of being frustrated over pain and fear, music helped them to focus on healing (ibid.).

In her research, Spychiger\(^{72}\) showed that music lessons in school had emotional, social and cognitive effects and that the pupils with more music education cooperated better than the control groups. The atmosphere was better and motivation for learning was stronger (ibid.).

**Art, health and wellbeing**

According to art historians, humans live nowadays in a more aesthetic world, where art, fashion and design offer countless aesthetic experiences\(^{73}\). When a person observes and appreciates different visual scenes, such as a piece of art, complex cognitive and emotional processes arise\(^{74}\).

In order to understand the meaning of a painting one often has to understand its different parts before one can understand the whole. During the observation of a painting and in the process of understanding it, a person can, for example, experience joy, participation, discomfort or interest. These emotional and cognitive responses are called aesthetic experiences (ibid.) and, according to Leder et al\(^{75}\), often lead to positive, satisfying and rewarding experiences for the viewer.

According to Kreitler and Kreitler\(^{76}\), art psychology is an empirical, scientific discipline that focuses on a person’s internal and external behaviour and how they are related to art. They believe that psychological models regarding art perception should be based on the homeostatic behaviour model, which suggests that there is an optimal physical condition in which humans strive to reach the balance between tensions and relief. This condition of tension and relief can explain some parts of the individual’s relationship to art, and that the art experience can help the person to restore the homeostatic balance (ibid.).

**The physical environment and productivity**

When a company’s management wants to increase productivity, they often focus on employee competence and personal motivation rather than on the physical environment and design\(^{77}\).

In his study, Herzberg\(^{78}\) observed the employee’s motivation and the relationship between workers’ behaviour and the physical environment. When the physical environment is perceived as disturbing, it can negatively affect the employee’s motivation and thereby productivity. Herzberg emphasised that it is necessary to have access to a physically supportive environment, which can contribute to the employee’s motivation (ibid.).

Maslow’s\(^{79}\) theory of motivation is one of the most well-known...
theories related to human need and motivation: it was developed to analyse and explain the social environment, but it can be applicable to the physical environment. For instance, the need for safety can be achieved through designed environments that allow people to have a good visual overview. If humans are not stimulated by their surroundings, they can easily lose interest and this can result in reduced performance. On the other hand, too much stimulation can lead to stress, since a person may not have the capability to deal with the stimulation.

Increased knowledge and consciousness about the relationship between improved health and increased profitability would affect how designers, architects and managers design, build and maintain buildings. For instance, improved indoor climate could improve employees’ health, decreases the number of sick days, reduces healthcare needs and increases productivity, which in turn strengthens the humane capital and leads to higher company profitability. Ergonomic improvement for the employees has also been proven to increase a company’s profitability.

For instance, IBM invested US$186,000 in ergonomic education and implemented extended ergonomic changes, whereby they changed the design of the workplace and different working tools. The improvements contributed to better working positions, improved illumination, lower noise levels and better support with heavy work routines. The project decreased sick days by 19%, which generated a profit of US$68,000 per year. In addition, the changes contributed to higher productivity and improved quality, which lead to a profit of US$400,000 per year. In other words, investments and changes within the physical environment lead to profits through an increase in health conditions and productivity.

Research in the field of health is still primarily focused on risk and prevention of diseases—a pathogenic approach—rather than applying the salutogenic perspective that focuses on factors that promote and strengthen individual health and wellbeing. A new research field, which focuses on the relationship between different factors in the physical environment and positive health promoting factors, should be developed. Knowledge of which environment factors contribute to health and wellbeing can thereafter be guidelines in making subsequent political decisions.

It is also important to have an interdisciplinary perspective where different individuals with different backgrounds and knowledge work together in this field—people like psychologists, architects, landscape architects, doctors, behavioural scientists, health promoters and so on.

The salutogenic approach provides a basic theoretical framework for psychosocially supportive design, which can promote health and wellbeing. Psychosocially supportive design should incorporate and consider factors such as access to symbolic and spiritual elements; access to art; good lighting; attractive space for social interactions; private spaces; and an interior environment that provides positive experiences. Other factors include visual and physical access to nature, and personal control over, for example, lighting, daylight, sound, indoor temperature and contact with other people.

These factors can stimulate, engage and improve a person’s sense of coherence, thereby enhancing his or her coping strategies and health. Psychosocially supportive design is not only the task for one person, but requires that the entire organization

understands the meaning of salutary management.

A new health paradigm

In summary, one of our intentions with this article was to shed light on factors in the physical environment that could promote health, wellbeing and increase an organisation’s productivity and profitability.

There is a need to systematically conduct more empirical studies that investigate and verify the salutogenic model and identify a range of wellness factors in psychosocially supportive design.

The study encourages decision-makers to implement psychosocially supportive design that in turn promotes health and wellbeing. It is time to step into the new millennium where the salutogenic approach and psychosocially supportive design lead the way for a new paradigm. Finally, it is necessary to understand Winston Churchill’s quotation—“We shape our buildings, then they shape us”—which states the buildings we design have a significant impact on human behaviour.

Alan Dilani is the founder and general director of the International Academy for Design and Health. His research at the Karolinska Institutet Department of Learning, Informatics, Management and Ethics (LIME) is based on a multidisciplinary approach, leading to a new definition of design that not only fosters functional efficiency, but also improves health processes.

References

This research is supported by a large number of references, which we are unfortunately unable to publish here for space considerations. For a downloadable copy of this paper with a full list of references, please visit: www.designandhealth.com
The MITIE mission: sharing medical knowledge here and around the world

ARTICLE BY DR BRIAN DUNKIN
Medical Director, Methodist Institute for Technology, Innovation and Education (MITIE)

Abstract: The Methodist Institute for Technology, Innovation and Education offers a new way for hospitals to improve their educational outreach and provide continuing professional development facilities for specialists from other medical establishments. The MITIE concept also reaches beyond training to research. This article sets out their experiences.

S
omewhere in Costa Rica, a patient awaits arrival of the latest laser technology to vaporize his enlarged prostate. Dr Carlos Calvaso at Hospital CIMA in San Jose is trained and ready to treat patients with the powerful 120-Watt High Performance System GreenLight™ laser as soon as it arrives. The experienced urologist has treated prostate conditions for years, but he learned how to use the newest, most advanced technology at the Methodist Institute for Technology, Innovation and Education – MITIE™ for short. In a two-day session in MITIE's temporary headquarters, Calvaso joined urologists from around the world for a series of lectures, live surgery observations and hands-on practice using GreenLight laser in bull prostates. “No hospitals in Latin America or anywhere have a lab like The Methodist Hospital,” Calvaso says. GreenLight uses a small fiber inserted into the urethra through a cystoscope. Laser energy heats the prostate tissue and vaporizes the enlarged portions. The procedure opens the channel for urine flow without the negative side effects associated with more traditional invasive surgery. “I appreciated the ability to watch live operations and see how difficult cases were handled,” Calvaso says. “The lab was very useful for us – it is an important issue in Latin America.”

Calvaso is one of about 500 physicians who have trained at MITIE in the last year. Sessions like this reflect MITIE’s mission to share medical knowledge and raise the bar for healthcare professionals in every field. “That’s what we’re here for,” says Dr Brian Dunkin, medical director for MITIE and head of endoscopic surgery at Methodist. “We’re here to train the world.” Methodist urologist Dr Ricardo Gonzalez led the May sessions at MITIE and helped bring this latest technology here. Methodist has since become a centre of excellence for treatment and training with GreenLight laser. “The MITIE lab allowed us to accommodate 30 urologists from eight countries,” Gonzalez says. “We used the conference room for didactic and video instruction and discussions. They next watched me perform four live surgeries telecast from the main urology operating room, during which they could ask questions in real time.”

Mini-MITIE
Since MITIE set up temporary headquarters within the last year, doctors from around the state, nation and globe, as well as nurses, allied healthcare professionals and medical residents from Methodist, have used the 17,000 square feet facility. Using the training space and state-of-the-art equipment, they have learned and practiced everything from airway and sedation management to sophisticated robotic mitral valve surgery and radiofrequency ablation for esophageal disease. Dunkin affectionately refers to MITIE’s temporary headquarters as “Mini MITIE.” When The Methodist Hospital Research Institute building opens in 2010, “big” MITIE expands to 40,000 square feet and will include a virtual hospital, 15 procedural training stations, five research operating rooms, six conference rooms and a med-presence room for high quality remote viewing of the operating room and other procedural areas. Administrators and their industry partners already are developing and designing areas with all boom-mounted equipment, including imaging screens and visual training aides. “MITIE is a fermentation vat for creative ideas,” says Dr Barbara Bass, chair of Methodist’s Department of Surgery and executive director of MITIE. “Even in its current form, MITIE really is unprecedented.” MITIE focuses on primary learners as well as

Photos courtesy of MITIE

Figure 1: Doctors at MITIE watching an operation in progress

Figure 2: Doctors at MITIE watching an operation in progress
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Samantha and iStan

Hundred have trained in MITIE’s simulation suite, home of Samantha, a high-tech mannequin with the capacity to offer practice on an unlimited number of medical scenarios.

Interventional radiology, catheterization, endovascular procedures – Samantha handles them all and more. “She can exhibit many different abnormal heart rhythms, blood pressure complications, stroke and even death,” explains Methodist’s director of surgical education. During a recent tour of MITIE’s temporary headquarters in the hospital’s West Pavilion, he talks with an industry representative putting the finishing touches on iStan, a high-fidelity, wireless patient simulator.

Not only does iStan have the capability to change into a female patient, but “his nose can drip blood, he has sites for chest tube insertion, he can even have a urinary catheter placed, if needed. The main point of this device is to train teams on advanced cardiac life support so they can better prepare to help patients in need of their skills,” Donovan says. Just around the corner at MITIE, two daVinci robots are available for practice in mitral valve repair, prostatectomies and other procedures. Here Dr Gerald Lawrie, one of the most experienced heart valve repair surgeons in the world, brought his entire operating room team to practice and perfect his own technique for robotic mitral valve repair. MITIE has become one of the busiest robotic training labs in the country. In another MITIE operating room, leading gastroenterologist Dr Ahila Ertan learned to perform radiofrequency mucosal ablation using the BARFPO Halo360 and Halo90 devices. This minimally invasive flexible endoscopy technique is used to heat and remove damaged esophageal tissue. Ertan, one of the world’s leaders in managing diseases of the esophagus, is now considered an expert in the Halo radiofrequency energy ablation system and Methodist is among the leading centres offering the technology. Methodist’s surgery and critical care team has taken over one of MITIE’s research operating rooms to set up a mock intensive care unit. Here they work to create a better model to display information. Currently, most critical patient information is located outside the room or on a confusing template that makes interpretation time-consuming and difficult. The team believes it can design a way caregivers can stay at the bedside and let technology record data. Ideally, physicians, nurses and supporting caregivers should be able to access important information and interact with it on a touch panel type display at the bedside. It’s one among hundreds of innovative concepts taking shape at MITIE. “MITIE allows us unlimited creativity,” Bass says. “MITIE’s multidisciplinary approach and its blending of technology, imaging and surgery are really exceptional.” One of its key research focuses is the development of teleproctoring, where communication and imaging links will allow Methodist experts to walk physicians through a case in real time, no matter where they are on the map. MITIE offered 16 training programs in the last eight months, not counting the robotic training labs. Dunkin hopes to increase that number to at least 40 in the next year. When “big” MITIE comes on line, the possibilities for training and research are limitless.
Improving patient satisfaction through employee satisfaction: focus on nursing satisfaction with support services

ARTICLE BY JOHN BABIAZ
Group President, ARAMARK Healthcare, United States

Abstract: The definition of patient care in today's hospital environment is transcending the clinical aspects of treating patients to emphasize a more holistic experience. As this perception of care is shifting, so is the composition of the care team.

Today, each element of the continuum, from the physicians to the support service teams, must work together as an interdependent group to achieve the best patient outcomes. To help build a more collaborative work environment, ARAMARK Healthcare set out to better understand the key opportunities to improve nursing satisfaction with support service teams.

Under the guidance of ARAMARK Healthcare and AONE (American Organization of Nurse Executives), nearly 50 Nursing Executives from across the US and Canada came together in November of 2006 to provide input on what a successful partnership between nursing and support services, such as patient transport, food, environmental and clinical technology services, would look like in the healthcare institution of the future.

Their input led to the development of the Guiding Principles for Relationships among Nursing and Support Services in the Clinical Setting. These guiding principles are intended to provide a roadmap for the creation of a stronger, more meaningful partnership between nursing and support services – a partnership that is ultimately focused on caring for patients and their families.

ARAMARK Healthcare is using the guiding principles as a basis to train its management and support service teams concerning the importance of the nursing/support service relationship and to raise sensitivity among its front line staff to some of the key issues. They are intended to inspire discussions among nurses and support service teams in a way that may not have taken place previously.

The guiding principles are outlined below:

Guiding Principle 1: Chief Nursing Officer as the catalyst for change

- Engage the senior executive team and Board to achieve partnership and leadership consensus in pursuit of new models.
- Set clear expectations for a culture of inclusion and collaboration.
- Exhibit leadership skills aligned with the AONE Nurse Executive Competencies.
- Be visible and model collaborative behaviors such as structured rounding and appreciative inquiry.

Guiding Principle 2: Inclusive shared governance

- Create models of care that promote collaboration and participation by nursing and support services groups.
- Shift current paradigms to include support services as members of the patient care team that supports the environment.
- Establish flexible organization structures that break down silos and create alignment.

Guiding Principle 3: Clear scope of practice

- Establish clear responsibilities, accountabilities, and applicable education for all team members – nursing and support services.
- Focus nursing resources on clinical care functions; articulating what nurses can do against the perception of what they should do.
- Facilitate professional development and talent management across the collaborative team.

Guiding Principle 4: Shared ownership of patient needs

- Develop realistic, mutually agreed upon goals that are measurable.
- Align expectations across collaborative teams through a performance management system that rewards the relationship between nursing and support services.
- Ensure that the patient experience is the focus of all services.
- Help all staff, both nursing and support services, to find a sense of meaning and purpose in their work through patient-focused goals.

Guiding Principle 5: Culture of mutual respect and recognition

- Bridge gaps and barriers created by professional, cultural, and generational differences.
- Cultivate sincere, authentic relationships that are grounded in trust and respect.
- Encourage a sense of equity and facilitate shared appreciation of nursing and support service jobs.
Guiding Principle 6: Safer, less stressful physical environment
- Provide a healing environment that is suited to the shared purpose of caring for patients and their families.
- Enable nurses to spend more time with patients by keeping supplies and equipment at hand and bringing services to the patient.
- Create a work environment that addresses the physical and emotional needs of staff.
- Optimize technology to enable collaboration, communication, service provision, and culture change.

Guiding Principle 7: Continuous, open communication
- Develop a common, patient-focused language that can be used by both nursing and support services.
- Establish a communication plan that disseminates key messages and decisions to all levels – in both nursing and support services.
- Implement mechanisms to measure and act on interdepartmental satisfaction and feedback.
- Communicate in ways that are culturally and linguistically appropriate.

Continuing to build on the momentum
After gaining initial insight into the issues, ARAMARK Healthcare and AONE, along with a consulting firm called the Studer Group, partnered on a joint research project designed to better understand nursing relationships with key clinical support functions and how to innovatively strengthen these relationships. This portion of the work led to the development of a first-of-its-kind survey instrument to measure nursing satisfaction with support services. This phase of the work included survey feedback from more than 1,300 nurses across the United States, who identified several gaps in nursing’s needs from support services vs. the performance that they are presently receiving. Among the gaps are:
- Frees up our time so we can do our jobs.
- Takes personal accountability when tasks are not completed.
- Lets others know when and if there will be a delay.
- Consistently has adequate number of staff to do the job we need.

In addition, a number of trends emerged from the data that are important to nurses when working with support service groups. These are:
- Communication.
- Team Work/Adaptability.
- Availability/Accessibility of Staff and Resources.
- Timeliness.
- Compassion/Consideration/Positive Approach/Professionalism.
- Knowledge.
- Proactive behaviour.
- Coordination of Care (throughput).
- Responsibility/Accountability.

Nurses also identified a number of critical needs that must be met by support service groups. These needs are baseline “must haves” that are essential to good nursing/support service relationships. They are:
- Interacts with others in a positive manner.
- Performs duties correctly.
- Provides us with important resources.
- Contributes to providing a safe environment.

Phase II work
To begin applying guiding principles and nursing satisfaction survey on a large scale ARAMARK Healthcare in the spring of 2008 entered Phase II of the project. The goal of this work at each hospital is to identify site specific gaps and to translate the learning into opportunities to improve nursing satisfaction with support services.

More than 6,000 nurses provided feedback through the nursing satisfaction survey tool. Participating hospitals include a range of both ARAMARK Healthcare partners and non-partners. Survey enrolment, administration, data collection and reporting will be handled by Intelscan, Inc., an independent third-party research firm.

The nursing satisfaction survey tool was administered online; and to ensure that the survey process has the support to succeed within each hospital, ARAMARK Healthcare coordinated with nurse leaders to advocate and communicate the project within their organizations. Communication materials including posters, e-mail and talking points were provided to help nurse leaders encourage participation.

At the end of the project in 2008, ARAMARK Healthcare partners who are participating in the study will receive a tool kit and strategies to help close any gaps that the surveys reveal to help them better align with the guiding principles. Non-partners also will be encouraged to use the feedback to develop action plans to improve nursing satisfaction with support services.

Beta site learning
To test the process for Phase II, ARAMARK Healthcare initiated a Beta project in the fall of 2007. A community based hospital located in the Mid West was selected as the Beta site. This hospital also participated in Phase I of the national nursing satisfaction project.

ARAMARK Healthcare’s Organizational Development team facilitated the work. This team uses adult learning, management science, training, change management, and systems thinking to addresses how change will impact the environment and critical stakeholders. The group teaches leadership and employees to overcome any resistance to change by alleviating learning anxiety and also coaches front line leadership on how to define the strategy, inspire the vision, and enable others to act.

The organizational development team was instrumental in forming a steering committee at the Beta site to gain feedback from both the nursing leadership as well as the leaders of the respective support service groups. One of the first steps was to create a tool and pre-assess the hospital’s alignment with The Guiding Principles for Relationships among Nursing and Support Services in the Clinical Setting.

While the Beta hospital scored fairly high overall in terms of nursing satisfaction with support services, the assessment identified opportunities to improve alignment by focusing on the three guiding principles listed below:
language that can be used by both nursing and support service groups; establishing a communication plan that disseminates key messages and decisions to all levels; implementing mechanisms to measure and act on interdepartmental satisfaction and feedback; and communicate in ways that are culturally and linguistically appropriate.

Continuing to build on the body of work

The initial focus of all of this work was geared to understanding the nurse’s perspective regarding support services, but some of the most frequent feedback that is voiced by nurse leaders is geared to gaining the perspective of the support service leadership. ARAMARK Healthcare is also exploring this side of the relationship. In fact, the company recently conducted a series of focus groups with support service leaders at hospitals across the country to help to better understand their perspective.

In addition, ARAMARK Healthcare and AONE are planning a second conference in the fall of 2008 involving Chief Nurse Executives and hospital support service leaders. The first conference in 2006 resulted in the development of the guiding principles. The primary objectives of the second conference will be to identify the role that support services can play in creating a more collaborative environment, and to explore the further development of tools for implementing the guiding principles.

John Babiarz is Group President of ARAMARK Healthcare, which includes Acute Care and Senior Living Services for nearly 1,300 healthcare organizations throughout North America.

“Clear scope of practice – this principle is geared to establishing responsibilities, accountability and education. It also is intended to help focus nursing resources on clinical care functions and it articulates what nurses can do against the perception of what they should do.”

“Culture of mutual respect and recognition – this principle suggests bridging gaps and barriers created by professional, cultural and generational differences. It recommends cultivating sincere, authentic relationships grounded in trust and respect; encourages a sense of equity and facilitates shared appreciation of nursing and support service jobs. It also recommends rewarding and recognizing all members of the team for their impact on the patient experience.”

“Continuous open communication – ideas outlined within this principle include developing a common, patient focused...”
Emergency room violence: an everyday threat

ARTICLE BY ALAN J BUTLER, MS, CHPA, Security Director, University of Wisconsin Hospital & Clinics, United States

Abstract: Rescue, Alert, Confine and Extinguish/Escape (RACE) a simple acronym used in hospitals across the United States to prompt staff on how to respond to a fire. A simple, consistent and long-term training initiative in which healthcare organizations invest an incredible amount of time, money and resources to properly train staff for an event that will most likely never occur during their career. Yet, ironically, that same level of investment has not been made in any standard training programme that addresses emergency room violence, even though statistical data clearly shows an increase in emergency room violence and the number of staff likely to be exposed to some form of aggressive/violent behaviour on a daily basis.

According to the Emergency Nurses Association and the American College for Emergency Physicians, occurrences in healthcare violence are on the rise, and the most prevalent and predictable location for violence is in the emergency room. Care providers are routinely exposed to volatile patients and visitors with drug or alcohol impairment, or suffering from psychiatric disorders. Add the stress of a traumatic injury, long wait times and slow throughput processes and you have today’s prescription for emergency room violence. This dynamic environment and its potential for violent disruptions have emergency room staff, physicians, hospital administrators and security professionals searching for answers.

In April 2006, a Level One Trauma, Academic Medical Center located in the Midwest region of the United States experienced a violent event that prompted the organization to move forward in the development and implementation of a planned response security program. The event unfolded at approximately 4:30 pm, on what might have been called a normal Friday afternoon. A very troubled patient with visible psychiatric issues and weighing over 300 pounds violently exploded with very little warning as he lunged toward a local police officer punching and biting that officer in the face. For the next 90 seconds total chaos broke out as staff, police and security officers rushed to intervene. Two local police officers, two hospital security officers and one corrections officer fought for their lives and the safety of every patient, visitor and staff member in the emergency room. The patient’s current state of mind and incredible strength resulted in injury to four of the five enforcement personnel. The disturbance began in a designated psychiatric patient room and ended in the waiting area. Eventually, the patient was subdued, but not without the risk of threatening the entire emergency room environment. Imagine how this event could have unfolded differently with an appropriate planned response security program in place.

A seasoned healthcare security professional can tell you how to secure an emergency room (where to put the cameras and which doors to lock), however the security element commonly missing is the educational component, which is different in every environment. Given this challenge, how does an organization build...
an emergency room security program that allows staff to recognize and respond to escalating aggressive behaviour? A place where they can feel safe and in control of their work environment while allowing patients to receive timely patient focused care? Although difficult, it is completely attainable and a must. Organizations can no longer stand on the side line and expect staff to react appropriately without first providing them with the tools and training to do their job effectively and safely.

Train to the environment

If there’s an elephant in the room, introduce them. Training (or the lack thereof) is our elephant, and in order to conquer it healthcare organizations have to come to the realization that a serious role conflict exists where personal safety and patient focused care collide.

Webster defines Role Conflict as the dilemma an individual experiences when required to play two different parts (e.g., patient focused healthcare provider and personal safety specialist) that cannot easily be harmonized. This is a problem that runs in the background for every healthcare provider. It is imperative that organizations give staff permission to enter certain situations thinking personal safety first. Personal safety first is a healthy component of patient focused care.

Key components

Educated/engaged staff – This is the most important component of the program. Take a multi-disciplinary approach to facilitate an exchange of information/perspectives and an appreciation for each other’s role. Build a team who are confident in themselves and their exchange of information/perspectives and an appreciation for each other’s role. Build a team who are confident in themselves and their exchange of information/perspectives and an appreciation for each other’s role. Build a team who are confident in themselves and their exchange of information/perspectives and an appreciation for each other’s role.

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Visible security presence – Whether you have in-house or out-sourced security or choose to use off-duty police officers, include them in the program and make them part of your emergency room patient care team. It is imperative that security and emergency room staff work together, respect each other and understand each other’s role.

Local police participation – Almost every serious incident involving violent behaviour in the emergency room involves the local police. They either arrive with or respond to the problem. For that reason, they should be an active participant in helping to develop and understand how their presence impacts your security programme.

As with any important and successful initiative there must be buy-in at the highest level of the organization. It takes commitment, time, money; commitment being the most important and frequently overlooked.
Come home safe

Emergency room violence is unacceptable. Shame on healthcare for allowing violence directed at our healthcare providers to go unchallenged, especially those working in our emergency rooms and shame on healthcare for not developing a simple consistent training initiative that addresses the issue. “Come Home Safe” used to be a send off reserved for our front line emergency responders, not our emergency room staff. It’s time we made it that way again!

Alan Butler is a security management professional with over twenty-seven years of leadership experience in public law enforcement and in the private healthcare sector. Mr. Butler holds a Master’s degree in Criminal Justice Management and is a Certified Healthcare Protection Administrator as designated by the International Association for Healthcare Security & Safety where he is currently a sitting member on the Commission for Certification. He has published healthcare security articles, a chapter on the topic of healthcare security and is a national speaker on the topic of emergency department violence.

wait times cannot be overcome, they should be supplemented with good communication.

Clearly defined roles – Confusion begins with the lack of clearly defined roles. This is further exacerbated when people in roles of leadership don’t respect and execute the program as trained. It is imperative that you have a plan, that roles are clearly defined, that you have strong leadership and that everyone recognize there is a time for leadership by committee and a time for strong singular leadership.

Response programme

Through training it’s possible to teach staff how to recognize environmental changes driven by excessive tension and/or inappropriate aggressive behavior. Staff should be comfortable interpreting changes and responding accordingly, whether it’s a singular event or a combination of events that force a change in environment.

The programme has to be simple enough that it can be executed quickly with immediate impact. Immediate impact could be complete resolution, or it could be the piece of mind staff gets from having a plan they have confidence in. Ultimately, it comes down to control. Emergency room staff members have to have a program that allows them to feel empowered and in control of their work environment. Imagine a programme that uses a simple green, yellow and red recognition system tied to a corresponding structured response grid. Each partner in the program understands their role as well as that of their co-workers. It can be that simple.

References

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Low hanging fruit: The National Health Policy Roundtable on Information Management in Australia

ARTICLE BY DR MICHAEL LEGG, ASSOCIATE PROFESSOR PATRICK BOLTON, DR DAVID MORE, MR RICHARD DIXON-HUGHES AND MS PRUE POWER on behalf of the Australian Healthcare and Hospitals Association (AHHA) Information Management Group, Australia

Abstract: Information management is recognized as an essential tool for improving the quality and safety of health care. Australia has fallen behind peer nations in the development of a health informatics strategy. In 2008, the Australian Healthcare and Hospitals Association (AHHA) convened an expert group which identified seven strategies to kick-start a speedier implementation of health information technology (ICT). These have been adopted as AHHA policy and promoted to the Australian government. The AHHA is the national organisation representing and supporting the public health-care sector in Australia. The Association is respected for its leading edge polices promoting evidence-based reform.

Better management and availability of healthcare information is an important weapon against disease, and there is mounting evidence that both health outcomes and consumer satisfaction can be enhanced by improving the way that health information is managed. In the short to medium term, it is also the tool most likely to address significant national policy challenges arising from the imperfect distribution of healthcare services such as inequitable access by Indigenous, rural and other socioeconomically disadvantaged Australians. Effective management and use of an individual’s health information is now recognised as a key national priority in most developed countries, for example the US, the UK, Canada and much of Europe. Australia was an early leader in the management and use of health information but is now falling behind these comparable nations. Health informatics in Australia is poorly planned and fragmented. There is an insufficient resource base of expertise and workforce, and a lack of engagement with the non-government health sector, IT industry and consumers.

The AHHA “Information Management Group”, made up of experts from clinical and academic areas, was charged with developing practical policy options for Australia. This paper describes the seven discrete projects identified by the Association which could be readily implemented in the short to medium term.

All of the projects are aimed at supporting a more sustainable health system through the deployment of appropriate applications, approaches and infrastructure based on ICT, at an estimated cost of up to AUD$300 million over the next few years.

The projects

IM-1 Accelerate the current health information infrastructure work programme, establish clear milestones and provide routine reporting to the community on progress

Essential elements of an information infrastructure as seen by the AHHA are in the areas of:
- privacy;
- person identifiers;
- provider identifiers; and
- interoperability infrastructure that facilitates:
  - interoperation between health messaging providers;
  - secure exchange of clinical documents;
  - broadband communication; and
  - conformance testing of standards-based systems interoperability.

The work programme being undertaken by Australia’s National E-Health Transition Authority (NEHTA) to build a national infrastructure for eHealth has many of these components, but progress has been slow. The AHHA suggests that AUD20m is required to add remote health facilities to the government’s National Broadband election commitment (2007), while a further one-off payment of AUD10m would fund the development of interoperation between present health communication providers.

IM-2 Fund the national standardisation of existing messaging for pathology and radiology for both public and private sector and use this as a communication backbone to the community for subsequent upgrading and expansion including for transfer of care documents (discharge summaries, clinical letters, specialist referrals)

The pathology and radiology sectors are leaders in the use of electronic messaging in Australia, and have delivered electronic information to their customers for more than a decade. Around 40
million pathology reports were delivered electronically in 2007 on a standardised platform which provides secure messaging. Many private sector health-care providers provide services nationally, across state and territory boundaries, and are frustrated by lack of government direction and funding to ensure national interoperability. Both public and private sector providers operate in similar ways, in similar markets and have a history of working with one another, so it is to be expected that lessons learned in one sector could be applied to the other.

Relevant standards, currently in their second revision, are robust and well supported, but there are sufficient differences in implementation to limit the opportunities that can be derived from interoperability. In particular, GPs now have the problem of running a multiplicity of software products on their desktop computers in order to receive and manage results from different service providers.

The AHHA recommends that the government:

- Fund the national standardisation of messaging for diagnostic services (pathology and radiology) for both the public and private sectors.
- Use this as a communication backbone across health for subsequent upgrading and expansion including transfer of care documents (e.g., discharge summaries, referrals and clinical letters).
- Develop an agreed profile and business framework with common systems for the different elements of the health system such as medication management so that all messaging providers can interact with one another.
- After set-up, ongoing funding should be based on outcomes – that is paid per conformant message.

It is estimated that this programme would cost around AUD20m to establish, with a further AUD10m per annum in recurrent expenditure. The initiative would establish an environment conducive to further improvement in a part of the health-care system that already crosses hospital-community and private-public boundaries. It improves and leverages an existing effective communication system that touches most aspects of health and aged care in Australia and is readily extensible for broader purposes.

IM-3 Co-ordinate and fund the development of common registry services for clinical, public health and surveillance purposes that can be used locally, and at State/Territory and national levels.

There are many registries in Australia operated by the local, state, and Commonwealth governments and international agencies. These include those for notifiable diseases, cancer, genetic and other chronic and familial diseases, perinatal morbidity and mortality, medical and surgical devices and procedures, immunisation, drug use and births deaths and marriages. Most are publicly funded and/or operate in the public interest. Most have common business requirements and much in common in relation to the collection, transfer, storage and analysis of data. In many cases the data comes from a common source such as diagnostic services.

Many of the existing registries lack important data needed for policy development to make the health system more equitable including information relating to:

- Aboriginal and Torres Strait Islanders;
- cultural diversity; and
- social disadvantage.

The benefits deriving from analysis of registry data, especially when there is the capacity to link between repositories, is well established and yet there remain considerable difficulties in data ownership, linkage and funding. Some of this is because of less than optimal national co-operation, especially between the states and the Commonwealth.

The opportunity to standardise health records, terminology, and clinical communications through registries where a regulatory environment already exists to assure conformance, and the value of doing so, is well accepted by key stakeholders including consumers and clinicians.

AHHA recommends that the government co-ordinate and fund the development of common registry services for clinical, public health and surveillance purposes that can be used locally, and at the state and national levels. There would be an initial establishment cost which may be more than AUD200m; however this needs to be offset against current and future registry expenditure. Clear benefits, in health-dollar costs and health outcomes have been demonstrated from registry programs.

IM-4 Fund the development of a National Library for Health that provides to all Australians quality-assured, timely knowledge in electronic form.

Many studies have demonstrated that gaps exist between the best evidence and common practice. Application of evidenced based medicine is the single most effective technology for improving health outcomes. There is good evidence that when consumers have access to good information and become engaged in their own health care their health outcomes improve.

Information management provides a means to ensure that consumers and health professionals have access to timely, useful, relevant, high quality knowledge to support better healthcare outcomes.

A National Library for Health that provides quality-assured timely knowledge to all Australians via electronic media is essential infrastructure for improved health outcomes and optimal use of resources. The AHHA estimates that there would be an initial project definition and procurement project cost of AUD20m, followed by ongoing knowledge delivery estimated at AUD20m per annum.

IM-5 Support and where necessary fund the development of a national consensus plan for effective management of health information, which is appropriately resourced and has governance arrangements that are widely supported by both the private and public sectors.

Australia lacks an agreed vision for its health system and specifically how this could be improved with better information management. It is both essential and urgent that there is an agreed vision and that an appropriately resourced plan is put in place. Government must support and where necessary fund the development of a national consensus plan for effective management of health information with widespread input from both the private and public sectors. Central elements of this are:

- A governance review to build on domestic and overseas...
experience and provide a foundation in widespread consultation and engagement.

- A health informatics capability and workforce review to identify the resources required to support the development and uptake of informatics in healthcare.
- A Public E-Health Education and Awareness Programme.

Both the governance and workforce reviews would cost less than AUD1m and could be completed in 6-9 months. The Public Awareness Program needs to be planned after the strategy and business case are defined.

IM-6 Ensure the State/Territory and Commonwealth regulatory environments allow for the development and uptake of personal health records.

The federal character of the Australian nation interacts with the complexities of health service delivery and consumer interests, including privacy, to create significant regulatory risks to the development of a national health informatics system. A National Personal Health Record Management, Access and Control Framework will:
- Ensure public confidence that personal health information can be safely stored and accessed as needed to improve care.
- Give clear guidance to the responsibilities of system providers and consumer expectations.
- Accelerate adoption and use of the Personal Health Record.

The AHHA estimates that a national framework consultancy could be established for AUD1m, additional to which there would be some modest implementation costs to government dependent on the final approach adopted.

IM-7 Establish a fund to promote the uptake of electronic medication management in the acute care sector.

Over 90% of Australian general practices have been using computerised prescribing for more than a decade, however these do not provide integrated communication with patients, pharmacies, and other health service providers beyond the practice, and most hospitals use paper based medication management systems. Adverse drug events in Australian Public Hospitals cost approximately $420 million in additional bed days in 2005–200610. Implementation of electronic medication management systems in every public hospital in Australia would cost AUD60m per annum ongoing, plus the cost of change management. This would raise the level of safety and quality in hospitals and reduce the cost of medical error and misadventure (estimated at AUD84–7,000 per bed per year)11.

Conclusion

The projects in this paper will ameliorate pressures placed on the Australian healthcare system from rising demand, limited resources and workforce shortages. The AHHA sees these recommendations as the “easy wins” which can establish momentum in adoption of modern information management by the Australian health-care system. An effective national health information management programme requires comprehensive planning and strong stakeholder engagement to succeed. Such a set of undertakings may cost in the order of AUD10–20 billion12, take 10 to 15 years to implement, and would be the outcome from the consensus plan developed under recommendation IM-5 above. Much of this investment is required in any event to support state priorities, but can be much better targeted.

Experience overseas has shown that substantial initial investment is required before returns are seen, but once this investment threshold is passed, benefits far exceed the costs. Dr Michael Legg PhD, FAICD, FAIM, FACHI, MACS (PDP) is President of the Health Informatics Society of Australia and Principal of Michael Legg and Associates, a consultancy in Information and Organisational Systems. He has more than 20 years experience in senior positions in the health industry. Before establishing ML&A he was Director Developments for Pathology, with what was then Australia’s largest private health care group, Mayne, and before that General Manager of Southern Pathology, winners of the Australian Quality Award for Business Excellence. He has been involved for many years in health informatics standards setting with Standards Australia and HL7 and has served on many National Committees including the National Health Information Standards Advisory Committee and the Australian Health Information Council’s subcommittee for Electronic Decision Support.

Patrick Bolton MBBS is Associate Professor (Syd) Graduate Diploma Computer Studies (Monash), Certificate in Health Economics (Monash), PhD (Syd), EMBA (AGSM) is currently the Director of Clinical Services (Clinical) at Prince of Wales Hospital. He has experience in health service administration and provision in both hospitals and general practice and policy development at state and Commonwealth level. He has particular interest in health service evaluation, health informatics, and health services integration across the hospital community interface and for chronic disease management. He is a Conjoint Associate Professor with the University of NSW.

David G More MB, PhD, FACHI is trained in Anaesthesia, Intensive Care and Emergency Medicine before completing a PhD in Clinical Pharmacology. For the last two decades he has worked and consulted in Health Information Technology. He is a HISA member and Director of More & Associates (Consulting) Pty Ltd.

Richard Dixon-Hughes is the Managing Director of DH4 Pty Limited and has long-standing involvement in health informatics with particular involvement in the development of health informatics interoperability standards in Australia and internationally. He is on the Board of Directors of Standards Australia, where he chairs the Finance and Audit Committee. Other appointments have included Chair of the Communications IT and eCommerce Standards Sector Board, membership of the HL7 Advisory Council, Co-chair of the IT/14/0 EHR Interoperability Subcommittee and a member of the Council for the National Association of Testing Authorities (NATA). Within DH4, he has led a range of ICT strategic planning and management consulting projects for health and government clients, which have included major studies for Australian Federal and State Governments relating to national clinical terminologies, health client identifiers, standards for sharing of EHR information, the business architecture for a national EHR system and national health informatics standards.
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Prue has worked at AHHA previously in the role of Deputy Director. Former roles have included Advisor to the Commonwealth Minister for Health, Senior Officer Policy Development Division (Workforce) Commonwealth Department of Human Services and Health and Secretary of the Australian Nurses Federation ACT Branch. Prue trained as a nurse at the Alfred Hospital in Melbourne. Prue has a Master of Population Health, ANU (1999). She is also qualified as an Arbitrator (University of Adelaide 2002) and Mediator (Institute of Arbitrators and Mediators 2001) and has a Corporate Directors’ Diploma (1999). Prue has served on several Boards of Directors, including 5 years on the ACT Health Community Service Board.

References

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* http://www.whitehouse.gov/stateoftheunion/2008

7. Sir Muir Gray, the UK NHS Chief Knowledge Officer, in an address to RCSI and AHIC DES Subcommittee 2005 and reinforced in keynote at Medinfo in August 2007.


Health Information Systems (UK) Ltd (HISL)

Introduction: Health Information Systems (UK) Ltd (HISL) supplies clinically rich electronic patient record systems (EPRs) to health institutions throughout the UK and around the world. Originally based at the world-renowned Guy’s and St Thomas’ Hospitals in London, the company has its roots in developing team-based EPRs, the first being used in diabetes management known as ‘Diabeta3’.

Such is the diversity of applications of the company’s EPRs that today there are versions available for use in diabetes, diabetes eye screening, cardiology, lipids, hypertension, endocrinology, sickle cell, urology and ophthalmology, with more disease areas continually under discussion.

Personal service
According to CEO Steve Courtney, the core of the HISL Team have been together for over 10 years now, although the Diabetes Clinical System has its roots going back to the 1970s.

“With the team initially based in the hospital environment and working with clinicians day to day developing and evolving systems, HISL brings an unrivalled depth of experience to help health professionals to design a system to match their own particular clinical requirements”.

However, with the HISL product range being developed into new disease areas, there was a need for re-branding, hence the generic name “VECTOR” was chosen as Steve outlines.

“The stable environment of the VECTOR Team helps us to offer a high quality service and our many years of health experience is invaluable, both to us when designing a system, and to our clients so that we can help them get the most out of the technology available.

Working closely with our clients on a daily basis, we consider ourselves less as a third party supplier, but more as a part of their team. Additionally, we maintain close relationships with the client’s own IT department, which is fundamental to the success of any system”.

Our track record speaks for itself, we have happy customers around the UK and overseas where VECTOR is configured to fit in snugly with clinical practice. We foster close relation-hips with team members at each hospital, allowing us to ensure that VECTOR supports and enhances all aspects of the care process”.

VECTOR History
Formally known as Diabeta3, VECTOR was developed at St Thomas’ hospital, London, UK in the academic Department of Medicine by a team of systems analysts and programmers, in close liaison with the St Thomas’ diabetes care team.

VECTOR now supports every aspect of the multidisciplinary care of patients with chronic diseases, and its users range from administrative and clinical staff through nurses, podiatrists and dieticians to consultant Diabetologists.

The development started over 25 years ago and has been mainly funded by research grants, with some contribution from the NHS. Since the spin-out into a commercial company, funds from the commercial sale of VECTOR to other hospitals has helped pay for its continued development.

In the early 1970s the first version of the diabetes clinical information system was developed. Since then, the system has become increasingly sophisticated, evolving into Vector Diabeta3, and is now in use in over 25 diabetes clinics around the world, supporting the full range of disciplines involved in the provision of diabetes care.

Flexible by design
As Steve Courtney explains, VECTOR has been designed, above all, to be flexible. “Over the many years we have supported clinical care, we have found that modifications to the system are required as standards and practices change.

Initially, we found that medical staff all shared information, but needed the facility to record their own specialised data. From this premise, VECTOR has grown to allow a depth of knowledge to be available to each discipline, as well as the facility to share core
Screening, being deployed at a number of programmes across the UK, including the largest in England at Greater Manchester, covering over 100,000 patients across nine PCTs, with data being captured from some 104 high street Optometrists and a variety of static and mobile camera stations.

VECTOR now offers a multi-disease electronic patient platform, covering a care pathway across diabetes management, diabetic retinopathy screening and the Ophthalmology sub-specialties of Cataract, Glaucoma, Orthoptics, Low Vision, Primary Care, Vitreo Retina, and Medical Retina, as well as covering other disease areas as mentioned above.

This multi-disease platform approach obviates the need for a healthcare organisation to procure a multiplicity of systems from several different suppliers, which would result in multiple databases, the duplication of data and effort, and a maintenance nightmare.

With VECTOR, one EPR services many disease areas, with the ability to link into other Hospital and national systems via an in-built integration engine, using industry standard methodologies. As future opportunities emerge for the development of VECTOR for other disease areas, these will be actively pursued and embraced by us for the benefit of patient care within the healthcare community as a whole”.

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Seamless patient care

When a site chooses VECTOR, they don’t just purchase a fixed set of screens for each specialty around which their clinical practice must adapt; instead they get a tailored system, with the detail of each of the screens entirely up to themselves. Specialized report writing, and ordering unique to the way individual organisations work can be incorporated, further tailoring it specifically to individual practice. VECTOR has therefore been written to be flexible enough to meet with the needs of today, and to adapt to the needs of tomorrow.

So, with the constantly changing needs of clinicians and management and the diversity of technology available, the direction taken in developing VECTOR has centred upon meeting these changes. This in-built flexibility ensures that an investment in VECTOR is an investment in clinical service for the long-term”.

Seamless patient care

Health Information Systems is now a successful commercial concern, with sales funding the further development of the system to meet the needs of international healthcare organisation, as Steve Courtney outlines:

“IT innovations such as the N3 network in the UK are being exploited and the inherent flexibility of VECTOR means it can be easily adapted to support the information needs across the whole care team, for example, improving speed and efficiency in primary-secondary care communication. GPs with access to N3 are now able to view their patient’s record held on the VECTOR database within the acute hospital from their own surgery. This further improves communication between primary and secondary care and allows patient care to become seamless.

Further, linking to N3 via secure tokens will likewise benefit clinicians making home visits by allowing access to the main system via any PC or laptop accessing N3, thus allowing information to be updated from remote sites.

VECTOR has also been developed for Diabetic Retinopathy Screening, being deployed at a number of programmes across the UK, including the largest in England at Greater Manchester, covering over 100,000 patients across nine PCTs, with data being captured from some 104 high street Optometrists and a variety of static and mobile camera stations.

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eHealth in developing countries: contemporary issues, challenges and opportunities for hospitals

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Abstract: eHealth is enabling the transformation of health systems, and will change, forever, the role of hospitals. eHealth will deliver benefits, in health workforce development, improved access to services, and knowledge gained from electronic health records. But there are also challenges of capacity, infrastructure, and connectivity. Working in partnership will help. Hospitals in developing countries can be the beneficiaries of the eHealth revolution, and not the victims, by properly playing this role in health system transformation. People are the key.

EHealth, broadly defined as the use of information and communication technology (ICT) in health, can make a world of difference in all countries – rich and poor, industrialized countries and developing countries. Perhaps the most notable attribute of eHealth is that it is enabling the transformation of the health system from one that is narrowly focused on curing diseases in hospitals by health professionals, to a system focused on keeping citizens healthy by providing them with information to take care of their health whenever the need arises, and wherever they may be.

Hospitals and hospital associations need to be aware of, prepare for, and properly manage, this transformation. It will change, forever, the role of hospitals in the business of producing health. It will make them more efficient, improve quality and strengthen processes. But it will also remove them as the centrepiece of the health-care system, and give hospitals a more forward-looking and progressive role. There are those who will see this as a loss for hospitals. We hope they are in the minority.

For, what is more important for hospitals – a central role in a disease model of healthcare that unwittingly fosters huge disparities and is likely to bankrupt the system, or a key peripheral role in a higher quality, more equitable, and more sustainable health system?

Opportunities – potential to strengthen health systems and improve health outcomes

To take full advantage of the advent of ICT in health, WHO has identified eight priority areas for its eHealth work. They are: access to health information; norms and standards to promote interoperability; legal and ethical issues; understanding the eHealth space through development of the evidence base for it; public-private partnerships for ICT R&D for health; and three application areas – health promotion, development of the health workforce, and service delivery. The net effect of this will be to increase productivity of the health system, improve quality, and ensure equity.

Three examples of how eHealth does this. First, providing access to services which were hitherto unavailable to patients, because eHealth tools allow practitioners to offer services beyond their physical reach. Decisions are made everyday in hospitals – clinical decisions about patients (diagnosis, options for therapy); staff; about research; administration and finance, and a host of other aspects of health. Decision support systems and access to remote expertise help people make better informed, decisions.

Secondly, ICT is enabling citizens to access health information and therefore make the transition from passive observers in the care process to active participants. And in some cases, patients will arrive at the hospital armed with more information on their condition than the health professional. Thirdly, eHealth is facilitating, on a systemic level, the translation from records of individual care to knowledge about the health of populations. There are many others.

Challenges

However, eHealth can be a double-edged sword. To benefit from it, health institutions, which already feel stretched for resources, will have to develop the capacity to use this great enabler. But it is precisely for the same reason – limited resources – that hospitals must invest in human and institutional capacity to leverage the power of ICT, to increase their productivity, through efficiency gains.

And although the general problem of infrastructure – telecommunications, power, transport (key to supply chains for drugs and other hospital supplies), and connectivity – is not only a major constraint but is outside the purview of hospitals and the health sector as a whole, advocacy and good public relations aimed at those who control the development of infrastructure can influence how the needs of health institutions are served.
People are the key
A key component of the capacity to leverage eHealth, and one of the areas of greatest need, is that of human resources for health. Many health systems, nearly all of them in developing countries, are in danger of not meeting the health MDGs because they lack the workforce to provide even basic services. Hospitals, with their need for highly trained workers, are at the forefront of this challenge. On the other hand, we know that ICT-mediated forms of educational delivery, such as eLearning, can help train health workers, of high quality and in sufficient numbers – on the job – without them being lost to services during the training, or, worse, lost to the brain drain phenomenon. Good examples include Brazil’s PROFAE initiative where the skills of 324,000 nurse auxiliaries were upgraded in just four years; Kenya is upgrading nurses to registered nurses at a fraction of the cost and in considerably less time; and the Seychelles has produced its first cohort of graduate nurses without a bricks-and-mortar nursing school.

The eHealth revolution is predicated on the trinity of people, processes, and technology. People are the key, because although technology and processes can change people, the greater influence pathways are those of people changing processes and technology – through inventiveness, innovation, creativity. National societies, as stewards of the profession and guarantors of quality in the work of their members, have a key role to play.

Some lessons learned
The National Health Service’s (NHS) Connecting for Health in the United Kingdom, has taught us at least two lessons. One is the power of going to scale. Before this programme, the NHS spent millions of pounds every year on eHealth over long periods but with no significant impact. The investments were not commensurate with the magnitude of the problem. With huge investments, in the tens of billions of pounds, positive results are being seen – NHS direct (telephone call-in service); Choose-and-book; PACS, to name just these. The NHS programme has also taught us, from its major failing – the reluctant buy-in by health professionals in England. The learning there is quite simply that people at the sharp end of the care process need to be brought on board – better yet, the process should be driven by them.

Across the Atlantic, the Canada Health Infoway has demonstrated the power of interoperability. This large-scale effort, and other smaller ones such as the OpenMRS, OpenEHR movements, etc. have led to the call for integrated eHealth systems as the overarching theme for global eHealth efforts. Health facilities in developing countries stand to benefit by adhering to this theme.

Partnership
But countries may have a difficult time going it alone. There is a need for a global eHealth partnership. Traditionally, when faced with a challenge in developing countries an organization is created to address it. The new organization soon insinuates itself permanently on the landscape – implying, unwarrantly, that the problem remains unsolved. What is needed is not a new, formal, legal entity that is likely to be unwieldy and introduce its own challenges in terms of governance, funding, management, sphere of influence, etc. What is required is a loosely-coupled arrangement whereby existing organizations agree to work collaboratively on eHealth matters. The International Hospital Federation, along with its member associations, should engage in this partnership.

Another useful type of eHealth partnership derives from the fact that groups of countries with common historical ties, and who cooperate in many development areas, would find great value in incorporating an eHealth dimension into their interactions and transactions. This is already happening in the European Union through the common eHealth ERA. This involves eHealth not as a stand-alone activity but eHealth woven into the fabric of other health sector activities. A smaller example, but no less significant, is the Community of Portuguese-speaking countries (CPLP), whose health ministers recently endorsed WHO’s ePORTUGUESe initiative as a key instrument to achieving their collective goals in health. Similarly, Commonwealth health ministers, on 19 May, 2008, mandated the Commonwealth Secretariat to develop a common eHealth programme for its member states. The same could be envisioned for La Francophonie (the commonwealth of French-speaking countries) and the Organization of the Islamic Conference, with its fifty-six member states, the largest intergovernmental organization outside the United Nations system.

Key partners
WHO, as the steward of international health, is a natural focus for eHealth collaboration. But it is also clear that the Organization does not have the capacity and resources to do all the convening. In the past, when working exclusively with government institutions in the South proved ineffective, a shift to working with NGOs led to improvements. WHO has identified two international NGOs with which it has a privileged relationship in the eHealth arena – the International Society for Telemedicine and eHealth, and the International Medical Informatics Association. They each have the status of NGO in official relations with WHO, and have national member societies in many countries. Together they could serve as surrogate convenors, and with their membership be the nexus of a global partnership for eHealth.

Industry, clearly is also a major player in the eHealth field, and collaboratives such as the Continua Alliance, which is driving the eHealth revolution is predicated on the trinity of people, processes, and technology. People are the key, because although technology and processes can change people, the greater influence pathways are those of people changing processes and technology – through inventiveness, innovation, creativity. National societies, as stewards of the profession and guarantors of quality in the work of their members, have a key role to play.”
development of interoperable products for home care are to be encouraged.

Making the eHealth connection – a Rockefeller Foundation initiative
Following the Pocantico II meeting in September 2007, the Rockefeller Foundation identified the challenge of weak health systems as one of five major issues that will frame its future investments. One leg of the health systems work is eHealth. To pursue this further, the Foundation has convened a series of Bellagio meetings in order to “collectively take stock of the current state of the different thematic areas of eHealth, work on agenda-setting, identify leverage points and next steps...” The Making the eHealth connection website (www.ehealthconnection.org) – is a rich source of the latest information on eHealth in the “Global South” – low and middle income countries. Issues, challenges, opportunities, best practices, practices to be avoided; video clips; contact information for leading minds in the field; even collections of “eHealth songs” are available on the site. A visit there is a must for those who wish to delve further into eHealth in developing countries.

Conclusion
As with all technologies, it is clear that various entities – people, institutions, organizations, corporations, associations, etc. – can be the beneficiaries of the eHealth revolution, or the victims of it. Hospitals and hospital associations in developing countries can opt for the former category, by properly playing their role in managing the transformation of the health system that is being driven by the eHealth.

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Using eHealth for mental healthcare reform in Ethiopia: the way forward in the new millennium

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Abstract: This article looks how a developing country such as Ethiopia can initiate mental healthcare reform against a background of extreme poverty and limited resources it highlights the need to make use of the wealth of information and communications available, with these it is possible for countries to develop effective policies.

Mental health is defined as a “state of wellbeing enabling individuals to realize their abilities, cope with the normal stresses of life, work productively and fruitfully, and make a contribution to their communities (WHO Book on Mental Health, 2).” Unfortunately in most parts of the world mental health is not accorded anywhere near the same degree of importance as physical health. Rather, it has been largely ignored or neglected even though four out of the six leading causes of years lived with disability are due to neuropsychiatric disorders (WHO Book on Mental Health, 2). The World Health Organizations (WHO) research for the Mental Health Global Action Program concludes that mental health problems are directly related to increases in mortality rates and years lived with disabilities (WHO Book on Mental Health, 4). Furthermore, the research has indicated that mental health problems impede socioeconomic development at the national level, and cost the global economy approximately US$ 44 billion per year (Human Resources and Training in Mental Health, 24). This situation is particularly dire in developing countries such as Ethiopia, where the majority of citizens have experienced elevated psychosocial stressors more so than other countries. According to the human poverty index, Ethiopia is the third poorest country in the world, has one of the highest HIV/AIDS prevalence rates and has experienced numerous conflict situations in and around its boarders for the last forty years (Ethiopia Country Cooperation Strategy, 1). Furthermore, Ethiopia is one of only four countries that does not have any of the following: national mental health policy, programme, laws or legislation (Ethiopia Country Cooperation Strategy, 1). Despite the fact that neuropsychiatric disorders account for the greatest number of Disability Adjusted Life Years (DALYs) for non-communicable causes in Ethiopia, over 60% greater than for the second highest category (WHO Department of Measurement of Health Information). Given these unique vulnerabilities it is clear that Ethiopia does need mental healthcare reform but in what capacity? How does a country with extreme poverty and limited resources revolutionize their healthcare industry to make mental healthcare available and accessible to the majority of citizens?

Approach
Answering these difficult questions requires research into which areas of mental healthcare development represent the best avenue for long term, sustainable progress. For over 30 years now the WHO has promoted the creation of research based mental healthcare policies, programmes and strategies as being one of the most essential and powerful components of national healthcare in every country (WHO Mental Health and Global Action Program, 3). Such policies, programmes and legislations have been proven to have a significant impact on the mental health and overall wellbeing of a population (World Health Organization, 20). In light of this information members of the ministry of health, and psychiatrists in Addis Ababa have embarked on a mission to create an informed plan of action as a method of establishing the foundation upon which future mental healthcare endeavours can be facilitated for the entire country. With the support from researchers and policy-makers from Griffith University in Australia, the necessary background research will be conducted to ensure that plans and future policies are based firmly on research and truly reflect the needs of the population. In recognition of the convergence between mental health and neuropsychiatric disabilities, this particular undertaking will include specific research aimed at addressing the why, the how, and the extent to which the two are interrelated.
How does disability relate to mental health?

For mental health, WHO’s measure of disease morbidity and mortality, the Disability Adjusted Life Years (DALYs) has brought a critical reality to light demonstrating that psychiatric and neurological disorders are amongst the most important contributors to the global burden of disease. In 1998, these disorders were estimated to account for almost 12% of the deaths and lost productivity due to all diseases and injuries globally (approximately 11% in middle and low income nations) increasing to 15% by 2020. Studies conducted separately by the WHO and by Ohlson, et al have found that across a range of disorders and disability measures, patients with a single mental disorder tended to be less disabled than patients with multiple disorders, but they were more disabled than patients with no mental disorder (Ohlson, 1734). Mollica and colleagues similarly concluded that psychiatric disorders, especially depression, are associated with physical impairment, social role impairment, and loss of productivity (Mollica, 438) in their study also showing a link between mental disorders and functional impairment. As a result, it is imperative that disability is included in any long term strategy designed to combat mental health problems within a country. In the Ethiopian context disability becomes even more paramount to consider given that in war affected populations the percentages of mental disorders such as PTSD, anxiety, and depression, increases dramatically, as do the rates of disability. For example, a cross sectional survey of Bosnian refugees found that those who reported symptoms for depression and post traumatic stress disorder were 5 times more likely to report disability than refugees without any reported psychiatric symptoms (Mollica, 436). Furthermore, the study found that psychiatric symptoms, trauma, age, handicaps, and perceived health status were all factors associated with significant increases in disability across refugee populations (Mollica, 437). As of January 2008 there were over 123,200 refugees receiving assistance from UNHCR in Ethiopia (UNHCR global appeal 2008-2009). Despite the enormity of this figure, the numbers of refugees and internally displaced people (IDPs) currently residing within Ethiopia’s boarders are perceived to be much higher than the above number indicates, as a large number often enter a country without reporting their status out of fear that they will be sent back to their home countries in conflict (UNHCR global appeal 2008-2009).

Methodology

To approach this project, psychiatrists and researchers from Ethiopia, Canada and Australia have used the policy creation guidelines package provided by WHO to direct the focus of the research methodology and literature review. In order to incorporate the vast amounts of information available on mental health and neuropsychiatric disability, and the opinions of international policy specialists, mental health experts, and experienced advocacy groups, the medium of choice was to use information communication technologies (ICTs) to maintain continuous discussions with all parties involved. The project will use the following ICTs: videoconferences, teleconferences, and the creation of a wiki website. As most health professionals are already familiar with the traditional method of information gathering, such as onsite interviews, focus groups and questionnaires (which will also be used within the project), this paper will focus on the newer technology based ways of accumulating data and creating health strategies. A Wiki is essentially a website that can be repeatedly altered in real time based on the suggestions of those who are invited to participate by the creator of the site. The project currently has a wiki website that was created in January of 2008, and contains a first draft of a potential mental health policy and a number of useful links to articles, and up to date information that will inform the development future plans and programmes. Also included is background information about Ethiopia’s healthcare industry, and the mental health and disability services that are currently available. The central idea behind using the Wiki medium is that a selected group of key stakeholders associated with mental health and neuropsychiatric disability in Ethiopia can contribute to the creation of the policy regardless of geographical determinants. In this capacity, experienced psychiatrists, neurologists and public health specialists living abroad, or in rural settings, can contribute their unique and valuable knowledge to influence positive changes in Ethiopian healthcare.

With access to the Wiki site, use of video and teleconferencing and on site visits for interviews, surveys and focus groups, we are trying to maximize the number of key stakeholders associated with mental health and neuropsychiatric disability that will have the capacity to collaborate and offer their insight as to which areas should be focused on in planning without the traditional, expensive, and lengthy process of researchers traveling across the globe to conduct face to face interviews. Unlike the one stop interview, this process is ongoing and research can be conducted on a continuing and progressive basis.

The plan of action

We will follow the WHO Mental Health Improvements for Nations Developments (MIND) project which describes the following as priority areas in establishing a plan of action:

Assessment of needs

Assessing the health needs of a population entails identifying which illnesses, both mental and physical lead to neuropsychiatric disability and how those disabilities subsequently affect the lives of those involved. In identifying which diseases are most prevalent and which have the highest impact on mental health, we will be able to target these specific areas and suggest methods for healthcare improvement ranging from increasing drug distribution to organizing awareness campaigns (Human Resources and Training in Mental Health, 4). Prior to this however, there must be an assessment of the current system of mental healthcare distribution within a country. Knowing who delivers mental healthcare services to whom, and what resources a country currently employs is of utmost importance in assessing the quality and capacity of a mental healthcare sector (Human Resources and Training in Mental Health, 4). Often times only a small portion of a country’s national healthcare budget is allocated to mental health despite the fact that for every dollar invested in mental healthcare a government can expect a 1.2 dollar return on its investment (Human Resources and Training in Mental Health, 4).
In Ethiopia, as is the case with many developing countries, over 95% of mental healthcare services are found in the capital, Addis Ababa, despite the fact it is one of the least urbanized countries in the world (4). In Ethiopia the government spends approximately 1.7% of the total healthcare budget on mental health despite the fact that the needs of the population are much greater than the amount of services available (Ethiopia Strategy Paper). In light of this disparity, the needs assessment section will investigate how funds are distributed and suggest possible alternatives to maximize efficiency and efficacy. In addition to these recommendations this section will also look at distributional patterns to assess whether one area is receiving a disproportionate amount of services over another. In Ethiopia, as is the case with many developing countries, over 95% of mental healthcare services are found in the capital, Addis Ababa, despite the fact it is one of the least urbanized countries in the world with over 85% of its population living in rural areas (Ethiopia Strategy Paper). This section of research will assess Ethiopia’s pattern of mental healthcare distribution and suggest possible areas which need to be altered in the plan of action based on the information assembled. It must be noted however that while there is a desperate need for rural mental healthcare, there is also a noted lack of psychiatric professionals in Ethiopia to meet this need.

Areas for action

Research conducted by the United Nations (UN) and the World Health Organization has found that over the last twenty years the most common areas of action singled out in mental healthcare policies and plans worldwide include: financing, legislation and human rights, organization of services, human resources and training, as well as treatment and rehabilitation (Mental Health as Call for Action, 5; Evaluation of Quality Care in Refugee Situations, 13; Doyle, 1).” Given the fact that twenty five percent of all countries in the world have no form of mental health legislation or laws protecting the human rights of people with mental disorders, the need for their creation is paramount (Mental Health Policy and Service Guidelines Package, 5). As previously mentioned, in Ethiopia there is currently an absence of nationally endorsed legislation, and human rights laws in place to protect people with mental disorders from being improperly treated. This particular portion of the project is highly important because it will focus research efforts into uncovering what the unique vulnerabilities in Ethiopia are so that future legislation, laws and programmes can be directed at meeting these needs. Examples of such vulnerabilities can be seen in Perceptions of stigma in people with epilepsy and their relatives in Butajira, Ethiopia a previous study that focused on: stigma and discrimination, misconceptions, and socially constructed ideologies in Ethiopia. The Areas for Action portion of the project will also draw attention to the positive attributes in Ethiopian mental health. Examples of this might include: the active Ethiopian Diaspora, the willingness and dedication of psychiatrists and healthcare officials to work towards progressive changes, and the many supporting institutions willing to lend support and resources to improve mental health and disability within the country.

Identifying who is involved and in what capacity

The WHO Mental Health and Global Action Program has shown that there are eight principle stakeholders to consider in respect to the provision of mental healthcare services within a country: “government agencies; academic institutions; professional associations; general health and mental health workers; consumer and family groups; providers; nongovernmental organizations and traditional health workers (WHO Mental Health and Global Action Program, 4).” This portion of the project will involve these organizations and individuals in ongoing discussions about how mental health and neurological disabilities has affected their lives and in what capacity they might be able to contribute in the future. This will be an important step in identifying who is currently involved in mental health within different communities, how they have been contributing, what they see as the current barriers to service delivery, and in what ways they would like to be involved in the future.

Development of pilot projects

The final section of the project consists of planning small scale initiatives aimed at targeting specific areas of mental health and neuropsychiatric disability with a view towards adopting those that prove successful on a wider scale (WHO Mental Health Global Action Program, 32). Three possible examples of matters that could be dealt with in pilot projects for Ethiopia are:

- The role of primary care in the prevention and early treatment of mental disorders and neurological disabilities.
- Mental health promotion and advocacy.
- Community care for persons with severe mental disorders.

Conclusion

While embarking on a project to create a research based strategy for mental health is an important undertaking, it must be mentioned that there are a number of potential draw backs to using an ICT-centered method. Firstly, in using the internet to update and share data there will be a large portion of the population without access to a computer or to connectivity that will be unable to participate in regular discussions that will ultimately inform the plan of action. To address this area we will also be conducting personal interviews, focus groups and onsite surveys with members of the community affected by mental health and neuropsychiatric disability that do not have access to computer technology. In this manner the end result will contain input from all sectors of society, not just the privileged few with internet access. The second potential draw back is the ability to consult with people from all rural areas of Ethiopia. Due to time and financial constraints on the project, researchers will be unable to travel to each rural community in Ethiopia to consult with stakeholders about mental health and disability services. We are also trying to address this shortcoming by attending conferences and venues where rural healthcare workers and interest groups will
be present and by visiting several select rural areas.

In summation, the wealth of healthcare information is more available today than ever before and it is up to us to take advantage of it. No longer is there a need for developing countries such as Ethiopia to remain behind the curve when it comes to healthcare programming and development. We believe that the development of policies and strategies are best achieved with input from as many of the stakeholders as can reasonably be employed, an issue of more closed door development strategies. With this open approach to assist in policy development we are hopeful that we can include more substantive input into the actual programs and strategies that will result from this research. With this type of methodology we are hoping to draw attention to the growing trend that recognizes that healthcare is no longer bound by geographical structure; it is an international discourse requiring international solutions.

Acknowledgements

The following people should be mentioned for their leadership in this endeavor and for their commitment to improving Ethiopian mental health: Dr Mesfin Araya, Dr Clare Pearn, Dr Assetta Ashengo, and Dr Kesetebirhan Admassu.

Ashley Pardy is the co-director of the Interactive Health Network (IHN) and project manager of the Academy for Sustainable Health Equity and Development (AHHED). Both are non-governmental organizations dedicated to improving health and disability services in developing countries through the use of information communication technologies. Now a full-time PhD student at Griffith University in Australia, Ashley started her university education at Queens University in Canada, where she completed her BA and then continued on to Australia to do her masters in International Relations. She is currently focusing her dissertation on mental health and disability research in Ethiopia and is actively involved in development projects in the Asia pacific region. Ashley has worked as a volunteer in Asia, Africa and South America.

Harry McConnell is a neuropsychiatrist specializing in disability with more than 20 years’ experience in both the clinical and public health aspects of health and disability. He has published five textbooks and worked as a Clinical Editor at BMJ Clinical Evidence. He has a keen interest in evidence-based policies for disability services and in ICT developments in developing countries. He trained in the USA, Canada, New Zealand and the UK. He also has a keen interest in evidence-based policies for disability services and in health and disability in developing countries. He is a Consultant Psychiatrist and Professor of Neuropsychiatry at Griffith University School of Medicine.

Bibliography

MAQUET Cardiovascular, a leading manufacturer of heart-lung machines and components for extracorporeal circulation, has therefore teamed up with experienced doctors and perfusionists to develop a comprehensive life-preserving system which is mobile and can be quickly deployed for a wide range of indications in cardiac surgery, cardiology, intensive care and emergency medicine. CARDIOHELP is the world’s smallest and lightest (10 kg) heart-lung machine. The portable system provides an extracorporeal replacement for the patient’s circulation and guarantees adequate oxygen supply to all vital organs. This prevents multiple organ failure, which is frequently diagnosed following undersupply of oxygen.

Extracorporeal circulation has become established as a standard procedure in open-heart surgery. Extracorporeal life support (ECLS) involves inserting cannulae into two large blood vessels to divert the blood into a circuit outside the body. A pump assumes the function of the beating heart, whilst an oxygenator acts as an artificial lung, cleaning the blood and enriching it with oxygen. The oxygenated blood is then returned to the body’s own circulatory system.

Therapeutic measures for treating acute failures of the body’s oxygen supply are usually only possible at specialized medical centers. In rural areas, in particular, adequate medical treatment for emergency patients is often unavailable, so patients are increasingly dependent on transportation to special hospitals. But transporting patients without mechanical cardiopulmonary support is extremely risky because they are often in a critical state.

The mobile heart-lung support system ensures adequate oxygen supply during inter- and intrahospital transportation and stabilizes the patient’s circulation. Weighing in at a modest 10 kg, CARDIOHELP is light enough for one person to carry and compact enough (50 cm long, 26 cm wide, and 30 cm high) to be taken on board a helicopter or vehicle.

CARDIOHELP not only opens up new possibilities for the emergency services, but, in the view of experts, enables a paradigm shift in the field of intensive care. By assuming the role of heart and lungs, extracorporeal circulation paves the way for new forms of treatment which put far less stress on the patient and are also considerably less costly than existing treatments. The compact design and user-friendly operation with a single push and turn knob and a touch screen mean that nursing staff in intensive care units after adequate training are able to use CARDIOHELP without any special perfusion background.

Every day more than 1,000 people in Germany die as a result of cardiovascular failure. Many of them experience cardiogenic shock because vital organs are not adequately supplied with oxygen. But if the patient is quickly connected to a mechanical circulatory support system, a fatal outcome can be averted. With CARDIOHELP, doctors gain valuable time and can save lives.

In cases of respiratory failure, the system can be used in combination with mechanical ventilation. For such patients, the extracorporeal circulation provides gentle support for the damaged lung and is particularly valuable in prolonged treatment of ARDS (acute respiratory distress syndrome, septic shock and multiple organ failure.

The treatment of patients requiring resuscitation is another area where CARDIOHELP offers new possibilities. The system is suitable for supplying oxygen in cases of acute cardiac arrest and supports cardiopulmonary resuscitation. Measures such as mechanical resuscitation or the use of a defibrillator are often unsuccessful and consequently lead to permanent damage.

The life-saving CARDIOHELP can be deployed in the treatment of poisoning, anaphylactic shock, refractory asthma attacks, and poly- or barotrauma. Furthermore, CARDIOHELP can also ensure adequate, life-saving oxygen supply for victims of near-drowning.


INFORMATION ABOUT THE MAQUET GROUP

The MAQUET Group is the global market leader for Medical Systems, focusing on the Operating Room (OR) and Intensive Care Unit (ICU). The integrated products of MAQUET are specially designed to deliver the best medical treatment within acute care hospitals. MAQUET provides innovative medical solutions from three Divisions: Cardiovascular with products for coronary artery bypass surgery, heart valve repair, aneurysm repair and extracorporeal circulation Critical Care for intensive care ventilators, anaesthesia machines, accessories and tailored services Surgical Workplaces for OR tables, lights and ceiling service units for the operating room, intensive care unit and prefabricated OR suites

MAQUET is part of the publicly-listed Swedish group of companies GETINGE AB, a company with a pro forma turnover of 1,995 billion euros (fiscal year 2007) and 11,100 employees worldwide. MAQUET itself has a pro forma turnover of 850 million euros (fiscal year 2007) with 4,100 employees, 30 international sales and service subsidiaries, and a network of over 200 dealers.
Nucleic Acid Testing (NAT) screening of blood donors in India: a project report

ARTICLE BY DR BHARAT SINGH, MD
Director, State Blood Transfusion Council, Guru Tegh Bahadur Hospital & University College of Medical Sciences and Government of NCT Delhi

Abstract: In the study there was no discrepancy found in the results of ELISA and NAT Screening for HIV-1 and HCV infections in the blood donors. All the ELISA reactive samples were found positive by NAT and all ELISA non reactive were tested negative by NAT technology.

There were 11 discordant samples found in the results of ELISA and NAT Screening for HBV infections in the blood donors. These were tested negative by ELISA and found reactive by NAT.

A major concern regarding the transfusion of blood and blood components is the potential for transmission of viral infections, particularly with Human Immunodeficiency Virus Type 1 (HIV-1) and HIV-2, Hepatitis C Virus (HCV) and Hepatitis B Virus (HBV). These agents are primarily transmitted by exposure to contaminated blood or blood and plasma products, exposure to certain body tissues or fluids, by sexual contact or by an infected mother to the fetus.

In most countries, the safety of blood is ensured by donor selection, testing of donations for viral markers and in the case of blood products, the inclusion of viral inactivation steps during the manufacture of the blood products. However, transmission of HIV, HBV and HCV continues to be a threat to safe blood transfusion, especially in developing countries. It is due to low numbers of voluntary donations, use of low sensitivity tests for viral screening and the high prevalence of these viruses. This has contributed to the high rate of transfusion transmitted infections compared with developed countries. In India, where the majority of donors are still replacement donors, the risk of transfusion transmitted viral infections is much higher than in countries with a 100% voluntary donor base.

The prevalence of post transfusion HBV and HCV in India is between 1 to 5%. The prevalence of HIV varies from region to region, being particularly high in western and southern parts of India (reference).

Serological screening of blood donor have greatly reduced, but not eliminated, the risk of transmission of viral infections by transfusion of blood and blood products. Detection of blood borne viruses by conventional serology tests rely on the production of viral specific antibodies. The production of detectable levels of antibodies or antigen occurs several weeks after the initial infection. During this interval, also known as the serological window period, virus is present in the blood of the infected individual and may be transmitted although the serological test is negative. Studies have shown that Nucleic Acids Technology (NAT) based testing for viral nucleic acid can further reduce the transmission risk of these agents in blood donations made during the sero-conversion window period.

The NAT blood screening is widely used by the countries like Germany, Italy, Switzerland, Canada, US, Australia, Taiwan, South Korea, Japan, Singapore, France etc. The safety of the blood has been assured for the recipients. This has also enhanced the safety of the component preparation and supply which are routinely used for transfusion requirements.

Aims and objectives
The main aim of this study were to determine the prevalence of HIV-1 window cases, as well as HCV and HBV window cases and HBV chronic donations, using the Roche COBAS AmpliScreen HIV-1, HBV and HCV NAT tests, in the blood donor population in Delhi, missed by current recommended serological screening. Routine blood donations collected by five hospitals in Delhi were tested for the study.

Currently all the blood donations are screened for various infectious markers using ELISA method. ELISA being the antibody based test would not identify the blood donations which are in the window period.

ELISA method detects:
- HIV> 21 Days post infections.
- HBV> 60 Days post infections.
- HCV> 75 Days post infections.

It implies that blood could infect, if infection is not detected in the window period.

The NAT screening available ensures 99.99% blood safety. NAT is one of the best available technologies in which Polymerase Chain Reaction (PCR) is used.

NAT screening reduces window period as follows:
- HIV> 11 Days post infections.
HBV - 20 Days post infections.
HCV - 15 Days post infections.

The introduction of Nucleic Acid Technology (NAT) testing has reduced the risk of transfusion transmitted HCV and HIV infections to approximately 1 in 1 million and 1 in 3 million respectively in Western Europe and the USA.

The Government of NCT of Delhi started this project with following objectives:

- Nucleic Acid Technology (NAT) be tested in project mode in one of the blood bank of Delhi.
- NAT technology be tested in one of the reference laboratories like National Institute of Biologics (NIB), Government of India, Noida.

It was decided by the high power committee chaired by Health Secretary Government, of Delhi that NAT technology be tested in project mode for a period of six months in Regional Blood Transfusion centre (RBTC) at Guru Teg Bahadur Hospital being the biggest blood bank of Govt. of Delhi under the supervision of Dr. Bharat Singh, Director SBTC who is based at GTB Hospital is also head of Regional Blood Transfusion Centre.

In this project mode study M/s Roche Diagnostics India Pvt. Ltd. agreed to provide the hardware as well as consumables and kits free of cost. The study has compared the efficacy of the results of NAT test with existing ELISA Kits.

**Observations and results**

The study was conducted at GTB hospital in a laboratory facility specially designed and constructed for NAT testing. Before the start of donor testing, local ethics committee (GTB Hospital) approval for the study was obtained by the Principal Investigator.

This study was conducted in two parts. An initial evaluation of efficacy of HIV-1 NAT screening of the blood donor population from five major blood banks in Delhi compared with current serological screening. The NAT Screening was done using Roche Cobas AmpliScreen HIV-1 Test. The five blood banks from various participating blood banks were GTB Hospital, Dr Ram Manohar Lohia (RML) Hospital, CN Centre (CNC) at All India Institute of Medical Sciences, Blood Bank Organization (BBO) and Sir Ganga Ram (SGR) Hospital.

A total of 10,176 random, unscreened donor samples collected from five major blood banks in Delhi compared with current serological screening. The NAT Screening was done using Roche Cobas AmpliScreen HIV-1 Test. The five blood banks from various participating blood banks were GTB Hospital, Dr Ram Manohar Lohia (RML) Hospital, CN Centre (CNC) at All India Institute of Medical Sciences, Blood Bank Organization (BBO) and Sir Ganga Ram (SGR) Hospital.

The samples were de-linked prior to transport and test so that testing was blinded. Primary pools that tested reactive were resolved to the reactive individual specimen as described in the package insert of the diagnostic kit.

The current recommended Serological test results on all individual donations were conducted by the individual blood banks and NAT screening was conducted in the laboratory specially designed at GTB Blood Bank premises.

All the 10,176 samples collected from different centres were subjected to HIV-1 Screening by ELISA technique by respective centres. The same samples were tested by Cobas AmpliScreen NAT technique. The result of the ELISA screening and the NAT screening are indicated in the table 2.

**Screening for HIV-1, HBV and HCV**

In the second phase of the study, efficacy of screening of HCV, HBV and HIV-1 using Roche Cobas AmpliScreen HIV-1, HBV and HIV-1 test was done in the blood donor population from GTB Hospital, Delhi compared with current serological screening tools.

In Part II, 5,040 samples from GTB hospital were tested for HIV-1, HBV and HCV using the Cobas AmpliScreen tests.

### Table 2: HIV-1 results for 10,176 serologically unscreened donations

<table>
<thead>
<tr>
<th>Anti-HIV-1 ELISA</th>
<th>NAT</th>
<th>Reactive</th>
<th>Non-reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>13</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Negative</td>
<td>10,163</td>
<td>3*</td>
<td>10,160</td>
</tr>
<tr>
<td>Total</td>
<td>10,176</td>
<td>36</td>
<td>10,140</td>
</tr>
</tbody>
</table>

### Table 3: Summary of HIV-1 results for 5,040 serologically unscreened donations

<table>
<thead>
<tr>
<th>Anti-HIV-1 ELISA</th>
<th>NAT</th>
<th>Reactive</th>
<th>Non-reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>12</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Negative</td>
<td>5,030</td>
<td>32</td>
<td>5,008</td>
</tr>
<tr>
<td>Total</td>
<td>5,040</td>
<td>44</td>
<td>5,008</td>
</tr>
</tbody>
</table>

### Tables below summarize the data for the HIV-1, HBV and the HCV AmpliScreen tests.

**HIV-1 Screening**

There were 12 NAT reactive/anti-HIV-1 positive samples and no discordant samples.

**HCV Screening**

For HCV, there were 10 NAT reactive/serology positive samples.
Conclusion
The man aim of this study was to evaluate the number of infected blood donors detected by NAT testing that were missed by the current serology tests (ELISA) used in India. In addition NAT can detect window period cases as well as low viremic, HBV carriers. In this study of 15,216 donors for HIV-1 and 5040 donors for HBV and HCV from New Delhi, no HIV-1 or HCV window cases were detected. However, there were 11 HBV yield cases (HBV DNA reactive, HBsAg negative), which were missed by the serology test of record. Thus the HBV NAT yield rate in New Delhi was found to be approximately 2:1000. Although four of these donors turned out to be anti-HBc positive and would have been detected by anti-HBc screening, it is inappropriate to use this test in India, as in most South East Asian countries, due to the high prevalence of HBV in the population, this would have resulted in an unacceptably high loss of donors. The HBV DNA in the yield cases was very low, between 182 IU/mL to 10 IU/mL.

In addition there were 3 more NAT reactive HIV-1 cases that were initially reported as negative by ELISA. Only because these samples were part of the study, retesting of these samples was resorted to at other Blood Banks using alternate tests which eventually corroborated the NAT findings. If these samples had not been part of the study, they would have passed as zero-negative samples.

The HBV NAT yield was higher in this study than in studies done in Western Europe or the US, where the reported prevalence is around 1:600,000 to 1:350,000. Similarly, with the higher prevalence of HIV-1 and HCV in India compared with Western Europe and the US (1:300,000 to 1:3,000,000) it is likely that testing a larger number of donors would lead to HCV and HIV-1 yield cases too.

The introduction of the Roche COBAS AmplicorScreen tests for HBV, HCV and HIV-1 was relatively easy. The operators were trained on the system and during the training determined the 95% LOD of the HIV-1 test. The result (87.3 IU/mL) compared favorably with the result reported in the HIV-1 Amplicor HIV-1 package insert (78.4 IU/mL). In addition, a cross contamination study showed that the operators were competent in using the system after a relatively short training period (1 week).

NAT testing for HBV DNA, HCV RNA and HIV-1 RNA using the Roche AmplicorScreen tests has been accepted by FDA, US as confirmatory tests for the serological assays.

Summary
In the study there was no discrepancy found in the results of ELISA and NAT Screening for HIV-1 and HCV infections in the blood donors. All the ELISA reactive samples were found positive by NAT and all ELISA non reactive were tested negative by NAT technology.

There were 11 discordant samples found in the results of ELISA and NAT Screening for HBV infections in the blood donors. These were tested negative by ELISA and found reactive by NAT.

Bharat Singh is presently working as Consultant in Pathology in GTB Hospital and also heading Regional Blood Transfusion Center (East) attached to GTB Hospital. He is also Honorary Director of State Blood Transfusion Council, Government of Delhi and is working for the improvement of Blood Transfusion Services of NCT of Delhi.

As a director of State Blood Transfusion Council Dr Bharat Singh is over all advisor to Government of Delhi for improvement of Blood Transfusion Services and achieving the goal of 100% Voluntary Donation in the Delhi the most ambitious project of SBTDC is computerisation of Regional Blood Transfusion Center and development of website for SBTDC and RETC. Dr. Bharat Singh was awarded Commonwealth fellowship for advance training in blood banking in 1991 in went to UK.

He was also awarded WHO Fellowship in Viroepidemiology in 1999 and went to USA for advance training "World AIDS Day 2002 Award". For active contribution in the field of HIV/AIDS, by Delhi State AIDS Control Society, New Delhi.

Dr Bharat Singh has widely traveled in India and abroad and has attended more than 55 conferences and workshop and presented papers. Dr Bharat Singh has published more than 17 papers in various national and international journals, books and magazines.

References
Chronic inflammatory bowel disease (IBD) consists of two main subtypes, i.e., Crohn’s disease (CD) and ulcerative colitis (UC). During the last decades, the incidence of CD has continued to increase worldwide, reaching incidence rates ranging from 3.1 to 14.6/100,000 in North America and from 0.7 to 9.8/100,000 in Europe. Incidence rates of UC differ greatly between studies and regions, varying from 1.5 to 24.5 per 100,000 person-years.

Crohn’s disease can be localized in any part of the gastrointestinal tract, although the location of predilection is the terminal ileum, involvement of the terminal ileum is observed in 90% of the patients with small intestinal CD, who in turn constitute 30–40% of all CD patients. In 40–55% of the patients both ileum and colon are affected, while in a minority (15–25%) only a colonic localization is observed.

The earliest change caused by CD occurs in the mucosa and submucosa and consists of hyperemia and edema. Tiny aphthoid or superficial ulcerations can be seen when disease progresses. In more severe disease, the disease extends transmurally with sometimes serosal involvement. In this stage, mucosal ulcerations merge to form deep longitudinal and transverse ulcerations while bowel wall thickening and narrowing of the bowel lumen can be observed due to significant mucosal edema and associated bowel spasms. In long-standing disease, chronic obstruction can develop due to scarring, luminal narrowing, and stricture formation. Extramural manifestations of CD are fistulas, abscesses, adhesions, creeping fat, and enlargement of lymph nodes. Ulcerative colitis exclusively affects the colon with a predictable way of spreading from distal to proximal in a continuous manner; the rectum is often involved, but rectal sparing can be observed. In previous cases, small superficial erosions can be seen, whereas in more severe disease these ulcerations can be quite large. However, only in very severe disease they penetrate the muscularis layer. The mucosa is thickened because of round-cell infiltration in the lamina propria. In chronic UC, a marked hypertrophy of muscularis mucosae can be seen, causing contraction, shortening, and narrowing of the involved colon. The submucosa becomes thickened because of the deposition of fat or, in acute or subacute cases, edema.

Diagnostic modalities

The gold standard examination for the small bowel traditionally has been small bowel barium examination (SBE), either by using an enteroclysis technique or by using small-bowel follow-through. SBE is invasive and burdensome, and requires an extensive bowel preparation (dietary restrictions, use of laxatives). Moreover, in the young population of CD patients, the ionizing radiation required for SBE limits the use of this technique for follow-up of disease.

The advent of video capsule endoscopy (VCE) and double-balloon endoscopy (DBE) has increased the diagnostic possibilities. For VCE a capsule is swallowed after a fasting period of up to 12 h and is propelled through the bowel by peristalsis. Thus, the mucosal surface of the small bowel can be depicted in detail (Fig. 1). However, with VCE there is no facility to increase visibility by insufflation of air or by tissue rinsing. Moreover, tissue sampling and therapeutic interventions are not possible. The use of VCE is contraindicated in patients with (suspicion of) obstruction due to the risk of capsule retention.

For DBE, a high-resolution video-endoscope with a flexible overtube is used. By alternately inflating and deflating two balloons attached to the overtube and endoscope the small bowel is threaded on the overtube. Both an oral and an anal approach are possible; for the oral approach no specific preparation is required, although patients are asked to fast for at least 6 h before the procedure. If the anal approach is used, bowel cleansing such as is employed for traditional colonoscopy is used. By using both the anal and oral approach, DBE allows visualization of the entire small bowel, with the possibility of obtaining tissue for analysis and the added advantage of the
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possibility of endoscopic therapy (e.g., dilation of a stricture, cauterization of a bleeding site). For DBE conscious sedation is a necessity. Traditionally, ileocolonoscopy (IC) with tissue sampling is considered to be the most valuable tool for diagnosis and follow-up of disease in the colon and terminal ileum\(^6\). As UC solely affects the mucosa of the colon, CS would suffice for diagnosis of disease and evaluation of disease activity and extent. However, when strictures are present as a complication of disease, these might hamper execution of a complete examination, while in severe attacks of UC CS is relatively contra-indicated due to the increased risk of bleeding or perforation. For ileocolonic severe attacks of UC CS is relatively contra-indicated due to the risk of perforation.

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**Cross-sectional imaging modalities**

The trans- and extramural extent of IBD cannot be visualized with any of the abovementioned techniques. Much research has been directed toward the potential of cross-sectional imaging modalities for the diagnosis and evaluation of IBD as with these techniques the bowel lumen, the bowel wall and the extra-intestinal abdomen including the visceral fat, the lymph nodes and the vascular structures feeding and draining the bowel can be visualized. An added advantage of these techniques is the fact that they are limitedly to non-invasive.

Ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI) are often used for the evaluation of the abdomen. While in the USA the technique of choice is CT, in Europe the focus is more on MRI and US. This inclination is reflected by the majority of CT studies on IBD patients originating from the USA, while the majority of published studies on MRI and US has been conducted in Europe.

**Diagnostic accuracy of US**

Most studies regarding diagnostic accuracy of US for diagnosis and follow-up of IBD have been conducted in the last decade. Although reported sensitivity and specificity values are high, with the state-of-the-art equipment diagnostic accuracy could possibly be higher than that previously reported. In the hands of an experienced radiologist, US can be very accurate for the detection of IBD. Reported sensitivity values for US for the detection of IBD in patients with suspected disease vary from 76% to 92%\(^\text{15-17}\); specificity values are also high. In patients with proven IBD, reported sensitivity values for US are higher, probably reflecting a higher index of suspicion\(^\text{18}\). Reported segmental sensitivity values are lower; these are below 79%, even if grey-scale US is combined with power Doppler\(^\text{19}\). Regarding the detection of extramural complications, fistulas and abscesses can be identified accurately on US\(^\text{20}\) (Figure 3).
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reported accuracy values are usually applicable for both subgroups of disease. Although in the study by Limberg and Osswald separate accuracy values are provided for US and CD, it is not clear from these data if accuracy values were obtained from post hoc separation of data. To our knowledge, as of yet no prospective study has been performed with predetermined imaging parameters to differentiate between CD and UC.

Although US can be used for the assessment of both small bowel and colon, disease localized in the duodenum and jejunum is often missed. Moreover, the rectum and distal sigmoid cannot be visualized accurately due to their pelvic location. This makes US less suitable for the assessment of UC. Doppler US has been proved useful in assessing whether IBD is in an active phase or in remission; significant correlations were found between Doppler parameters and disease activity, both in UC and in CD.

However, the only distinction made was between active and inactive disease, meaning no conclusions can be drawn about the severity of active disease from these data. As of yet, there is no standardized scale to determine the degree of disease activity on US, neither for CD nor for UC.

The spatial resolution of US is not high enough to permit the detection of superficial pathology, making this modality less suitable for the diagnosis of early diseases when compared with SBE. Although SBE can reportedly be highly accurate when performed by skilled radiologists, compared with VCE or DBE its sensitivity is low. In this regard, comparison between US and VCE and/or DBE might be very interesting in order to determine the accuracy of US for small lesions and accuracy for bowel segments that are difficult to access. To our knowledge, no comparative studies have been performed as of yet.

Computed tomography

Patient preparation. Patients are usually asked to fast for several hours before the scan to diminish peristaltic movements. In addition, in some institutions a bowel-cleansing regimen is applied, as a rule consisting of mild laxatives. Dietary restrictions are also often applicable. Although with this bowel preparation residual feces are usually present to some degree, the mural presentation of disease enables the identification of disease even if the bowel wall is partly obscured. There is consensus as to the indispensability of enteral contrast medium for an abdominal CT examination for IBD. The contrast medium of choice should be neutral (meaning an attenuation value comparable with water), as a neutral contrast medium allows optimal distinction between bowel wall and lumen. While in some institutions an enteral contrast medium is administered orally (CT enterography),
in other institutions controlled distention is achieved by inflow of contrast medium through a nasojugal catheter (CT-enteroclysis). Although by some authors CT-enteroclysis is pre-pagated as the controlled infusion provides a more consistent distention of the small bowel than CT-enterography, especially of the jejunum, others report that with the right choice of contrast medium and correct timing of intake excellent distention of all small bowel loops can be obtained after the oral administration of contrast medium. In only one small study CT-enteroclysis and CT-enterography were compared, but both the bowel lumen remaining (arrowheads) with only a pinpoint thickened bowel wall of the ileum because of the stenosis. Axial image shows the severely obstructed bowel lumen remaining.

**Figure 5:** A 25-year-old female patient with known CD of the terminal ileum (same patient as pictured in Fig. 3). A CT-scan was performed to determine involvement of the small bowel. Coronal TrueFISP image shows good distention of jejunal bowel loops after oral administration of contrast medium. B A 12-year-old male patient with known CD undergoing MRI-enteroclysis to evaluate the small bowel. Coronal TrueFISP image shows good distention of jejunal bowel loops after oral administration of contrast medium. C Coronal image shows the fistula (arrowhead). D A 60-year old female patient with known CD of the terminal ileum who underwent CT-enteroclysis to evaluate the small bowel. Coronal TrueFISP image shows good distention of jejunal bowel loops after oral administration of contrast medium.

The accuracy of CT has mainly been investigated for small-bowel disease. In suspected CD sensitivity was 83% when compared with SBE. When compared with ileoscopy sensitivity values vary from 80% to 88% (35–37). Segmental sensitivity of CT was somewhat lower (71.8%) in a study by Molnar et al. (38), comparing CT with SBE and CS. Superficial lesions (such as aphthoid lesions) are not accurately visualized on CT, making CT less suitable as a first-line examination for the suspicion of mild disease.

This was already evident from studies comparing CT with CS and/or SBE, but in a recent meta-analysis comparing CT with VCE it was shown that the yield of CT compared with the yield of CE was 30% vs. 69% (39). No comparative studies have been published regarding CT vs. DBE.

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It will be love at first sight when you see the outstanding performance of the PENTAX Hi Line system. The EPK-i processor and 90i endoscope series will open your eyes with their next-generation HD+ technology and forward-looking features.
Hardly any studies have focused on the accuracy of CT colonography for the detection of ileocolonic IBD. This is possibly partly due to the fact that for the rectal administration of contrast medium the rectum is obscured by the rectal catheter, precluding diagnosis of rectal IBD, specifically UC. It does seem clear that CTC is unable to detect ulcerative lesions; even diffuse inflammation with large ulcerations can be missed. CTC might however be useful in patients with colonic stenosis or inflammation with large ulcerations can be missed. CTC might however be useful in patients with colonic stenosis or narrowing.

**Magnetic resonance imaging**

**Patient preparation.** While in some studies on MRI a period of several hours of fasting was deemed sufficient, in others full bowel cleansing was performed, as the reference standard, (i.e., CS) was performed on the same day. There is no consensus yet as to what constitutes the optimal bowel preparation for MRI. However, as a limited bowel preparation does not seem to negatively affect accuracy, it might be sufficient to limit the bowel preparation to a fasting period taking into account the patient-friendliness of the respective preparations. Luminal distension by means of use of enteral contrast medium is indispensable for an adequate evaluation of the bowel as collapsed bowel can hide or mimic disease.

As was the case with CT, for MRI of the small bowel contrast medium is either administrated by mouth or by enteroclysis. An advantage of MR enteroclysis over MR enterography is the fact that it allows fluoroscopic monitoring of the inflow of contrast medium and thereby provides functional information on bowel distensibility. An advantage of MR enterography is the fact that it can be considered more patient-friendly and also that no ionizing radiation is necessary. To our knowledge, only one study has been carried out in which both methods of contrast medium administration were compared. In this study by Schreyer et al.47 all patients (n = 21) underwent both MRI enterography and MRI enteroclysis; no difference in accuracy compared with SBE was noted by the investigators (Figure 6).

Whereas for MR enteroclysis mostly a methylcellulose suspension is used, for MR enterography many different contrast media have been tested. The main subdivision is between positive, negative, and biphasic contrast media. A biphasic contrast medium performs best for the identification of pathology on both T2-and T1-weighted sequences as adequate delineation between hypointense bowel wall and hypointense lumens is seen on T2-weighted sequences while on T1-weighted images the enhancing bowel wall can be easily discriminated from the hypointense lumens. An artificial sugar-solution (mannitol or sorbitol) has been shown to cause good distention of small bowel loops with negligible side effects.

**Imaging technique.** Mostly, both T2-weighted and T1-weighted sequences are used for the MRI evaluation of the bowel. On T2-weighted images the bowel wall can be appreciated and bowel wall stratification—if present—can be well appreciated. As feces can show bright signal intensity on T1-weighted sequences, it is important to perform a pre-contrast T1-weighted sequence in order to be able to determine whether high signal intensity was already present before intravenous contrast administration, indicating the presence of stool.

Another sequence that is propagated by many authors is the TrueFISP sequence, a sequence that is insensitive to motion and breathing artifacts. This sequence, that makes use of a T2/T1 ratio, adequately delineates the bowel wall and the mesentery, allowing adequate assessment of disease (Figure 7). When combining a T2-weighted sequence or TrueFISP sequence and a T1-weighted sequence, a comprehensive MRI examination can be carried out in less than 30 min. Imaging criteria. A bowel wall thickness exceeding 3 mm should be considered as an indicative criterion indicative of active IBD is pathological bowel wall enhancement after the administration of intravenous gadolinium. Bowel wall enhancement can always be seen as the bowel is a highly vascularized structure. However, in active IBD increased enhancement can be observed, due to the increased vascularization and the increased capillary leakage of the affected tissue (Figure 8). In CD it has been hypothesized that the degree...
of enhancement correlates with the degree of disease severity, but this statement has not been extensively corroborated.\textsuperscript{50–53}

Bowel wall stratification can be observed on T2-weighted images as a bright line within the two dark stripes of the mucosal and muscularis propria layers, likely related to the presence of fat or edema in the submucosal layer. On fat-suppressed T2-weighted images it is possible to determine the nature of the bright signal as a persistent bright signal suggests the presence of edema, whereas complete suppression of the submucosal signal suggests fat infiltration and quiescent disease.\textsuperscript{54} Extramural edema, whereas complete suppression of the submucosal signal as a persistent bright signal suggests the presence of abscesses. Abdominal US shows a fistula in the extramural disease. Due to the high contrast resolution abscesses, fibrofatty proliferation, and enlarged lymph nodes.

**Diagnostic accuracy.** The accuracy of MRI of the small bowel has been extensively investigated. In many European institutions, conventional enteroclysis is increasingly being replaced by MRI enteroclysis or MRI enterography as MRI has proved to be highly accurate in both the detection of disease in patients with known IBD as in patients in whom IBD of the small bowel was suspected.\textsuperscript{55} However, the studies that have been performed were mostly small and concerned selected populations with either a high suspicion of disease or known CD of the small bowel. Larger studies including the full spectrum of disease activity should be conducted.

As was the case with CT and US, MRI is not suitable for the detection of superficial disease due to the limited spatial resolution. This finding is corroborated by a study comparing MRI and VCE in patients with CD.\textsuperscript{57} Significantly more inflammatory lesions were detected with VCE in the jejunum and partly in the ileum of patients with CD. However, these findings had no effect on the therapeutic approach of the individual patients. The accuracy of MRI has not been compared with DSE as of yet.

As mentioned before, MRI can be used for the evaluation of extramural disease. Due to the high contrast resolution abscesses are very conspicuous on T1-weighted fat-suppressed images after the administration of Intravenous Gadolinium. MRI is also very sensitive for the detection of fistulas.\textsuperscript{58–60} (Figure 9).

In recent years, the accuracy of MRI for the detection of ileocolonic IBD has been investigated by means of MRI colonography. After administration of rectal contrast medium the colon (and sometimes the terminal ileum) was assessed for disease. Conflicting results were reported; while in one study high accuracy values were reported, in others segmental sensitivity values were around 32%.\textsuperscript{61–63}

Regarding the accuracy of MRI in differentiation between CD and UC conflicting results have been reported; while some authors report that based on the location of inflammatory changes, the degree of involvement, the continuity or discontinuity of disease, and the presence of complications it was possible to differentiate between CD and UC,\textsuperscript{64–66} others report a limited value in differentiation of disease.\textsuperscript{67} Theoretically, a whole-bowel examination would be possible with MRI, by the administration of contrast medium orally and rectally. This has been attempted\textsuperscript{68} and was deemed feasible. More research is needed to establish the diagnostic value of this combined approach. At the moment, MRI colonography does not seem to be able to replace CS.

**Discussion**

Compared with conventional imaging methods, CT, US, and MRI are accurate methods for the detection of IBD of the small bowel, both in patients suspected of disease as in patients with known IBD. Although subtle lesions cannot be depicted with any of these modalities, clinically more relevant findings can be accurately depicted. Therefore, cross-sectional imaging should be incorporated in a comprehensive clinical evaluation of suspected IBD and for follow-up of CD. The exact role cross-sectional imaging techniques can play for follow-up in UC should be more extensively studied.

As US is easily accessible, widely available, and inexpensive, it is recommended to use abdominal US as first-line modality in patients with suspected IBD of the small bowel. MR enterography would be a good alternative, especially as the assessment of the degree of disease activity can be better performed on MRI than on US. Although CT enterography is a very accurate technique and is used in many institutions, its role in IBD is limited by the ionizing radiation needed, especially due to the repetitive use for follow-up in often young individuals. If possible, it might be advisable to reserve this technique for patients in whom imaging is needed at very short notice as CT enterography can be performed very fast and is readily available.

Although VCE has shown to be more accurate in depicting subtle lesions in the small bowel than MRI or CT, its role should be limited as of yet as the true benefit of VCE is not clear yet. As there are presently no standardized criteria for the diagnosis of CD with VCE, definitions with regard to what constitutes a positive finding might differ between studies. Moreover, the clinical significance of finding a single mucosal break or a few superficial aphthous lesions is not clear yet. Also, specificity and positive predictive values for VCE have not been established. At this time, it might be good to reserve VCE as a second-line modality if cross-sectional imaging has not shown abnormalities but the suspicion of disease remains standing despite these negative findings.

**References**


**Figure 9:** A 25-year-old female patient with known CD of the terminal ileum (same patient as pictured in Figs. 3 and 5). A Coronal T1-weighted image clearly shows the abscess (arrowheads) that was also depicted on US and CT. B Coronal T1-weighted image showing a fistula.

References continued

Clinica practice focus: diagnostic imaging

International Hospital Federation Reference Book 2009/2010
Introduction: In neuro analysis and diagnosis more and more procedures rely on sophisticated and well-developed methods for data acquisition, storage, and analysis of electrophysiological signals (e.g. ECG, EEG, EMG, NCV, EP etc.). Almost all paper-based concepts have now been replaced by computer-based methods. One of the obvious advantages of this development is the availability of the data in digital form, ready for further processing and analysis. This does not mean that the medical specialist has become obsolete. On the contrary he/she has to be able to handle, understand, and interpret computer-generated data. Combining the added information with the specialist’s knowledge will help to deliver faster and solid diagnostic findings. The patient will benefit from this development alike.

Neurophysiology network

Computer based digital EEG systems are standard in most EEG laboratories. The systems should be networked to allow for separate recording and review stations. A sophisticated network for diagnostics in Neurophysiology will feature a versatile database and in addition to EEG recording/review stations also EMG units for recording NCV (nerve conduction velocity, electromyography and evoked potentials).

Great care should be taken that the application software is designed with the needs of the EEG/EMG personnel in mind. There are systems on the market, which are very easy to use with little computer jargon and good knowledge of the tech’s and the neurologist’s requirements.

Figure 1: Neurophysiology network with networked recording stations (review stations and server not shown)
Videometry
Especially in Epilepsy monitoring (EMU) a time synchronized video recording of the patient’s behaviour is a standard procedure. But also routine EEG workstations are being equipped with digital video today. The advantages for the reviewing neurologist are obvious. He/she can at any time review the patient’s reaction during certain artefact or other unclear EEG situations. Practical Videometry review software will arrange the video window side by side with the EEG window or on a separate monitor.

EMG and Evoked Potentials
Traditionally the EPs are packaged together with the EMG equipment. We can see a trend to package the EP together with the EEG equipment, because the technologists perform most of the EP tests. The EMG machine, which is the investigative tool for the neurologist, would then be free just for EMG/NCV testing, whereas EPs are tested on a dedicated EP machine or the EEG machine with an EP option.

Combined workstation
Specifically for intensive care and OR usage a combined EEG/EMG/EP workstation may be the solution of choice.

Ambulatory recording
The possibility of recording electrophysiological data during normal working situations, at home, and during sleep periods is very important and technological advances of the last years helped to overcome the early technical problems. The current trend for ambulatory recording systems is “solid state”. Very compact digital recording devices using compact digital storage media are available. Especially for 24-hour recording of multi-channel (e.g. 16 channels) data, as required for EEG and polygraphic sleep recordings, a large data storage capacity is required (i.e. several hundred Mbytes).

An elegant solution will integrate the 24-h recording devices hard- and software wise with the routine EEG equipment.

EEG Analysis
Standard EEG analysis packages comprise spectral analysis and brain mapping. These packages should be easy to use and available as an option for the routine EEG.

Sophisticated analysis packages are available for spike/ seizure detection and also for dipole analysis. If the basic EEG software offers interfaces to such advanced analysis options a path for future upgrades is in place.
The Effective Use of Tomosynthesis in Orthopedic Surgery – Follow-up after procedures using metal

ARTICLE BY HIROYASU YANO
Hachiya Orthopaedic Hospital

Introduction:
Opened in 1959, Hachiya Orthopedic Hospital is committed to providing superior medical care in a caring environment that creates tomorrows filled with dreams, hopes and good health. In keeping with this commitment, we digitalized ordering in 1996, completed image digitalization in 1998, and added a urology department in 2004 to maintain a continuously high level of medical technology and service. The hospital is a 52-bed acute care hospital that conducts over 550 operations per year, including leading-edge treatments such as minimally invasive artificial joint surgery and endoscopic surgery.

Metal implants, plates, and screws are commonly employed during orthopedic surgery. These frequently cause problems with metal artifacts during CT or MRI examinations of bone union and in post-surgical follow-up observations. This is a report on the use of tomosynthesis to restrict metal artifacts in images.

Current Tomosynthesis Status
Since introducing the flat-panel detector (FPD) in August 2005, we have conducted tomosynthesis examinations on 35 artificial joint cases (20 hip, 10 knee, 5 elbow), 8 spondylodesis cases, 3 arthrodesis cases, and 4 osteosynthesis cases.

Evaluation as clinical images
Tomosynthesis images created by the shift-and-add method and filtered back projection (FBP) method were compared to CT images.

Equipment used:
Shimadzu Sonalvision Safire R/F system with Tomosynthesis Workstation option
MSCT: Company A, 6-slice CT

Clinical images
Clinical image 1: Post-surgical images of bilateral total hip replacement
The left joint was replaced in a 73-year-old female patient 11 years after bilateral total hip replacement surgery, due to looserness of the stem.
The bilateral hip replacement post-surgical CT image in Fig.1 B) includes significant artifacts due to the implant between the acetabulum and trochanter.
The shift-and-add method image in Fig.1 C) exhibits no effects of artifacts, whereas the FBP image in Fig.1 D) exhibits artifacts in the tube-shift direction and at the boundary of the implant.

Clinical image 2: Fracture after knee replacement
A 59-year-old female who had undergone knee replacement surgery due to osteoarthritis of the knee suffered a fracture of the lateral tibial plateau due to a fall. The CT image in Fig.2 B) exhibits effects of the implant artifacts to the lateral side of the tibia. However, these effects do not extend to the lateral side in the shift and add method image or the FBP image (Fig.2 C, 2 D).

Clinical Image 3: Follow-up of anterior fusion of cervical vertebrae.
After surgery for a cervical hernia on a 39-year-old male, anterior fusion was conducted from the 3rd to the 6th cervical vertebrae, as shown in Fig.3. Periodic follow-up observations were required
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because of delays in bone union at the bone graft periphery on the 5th and 6th cervical vertebrae. Tomosynthesis was used, due to its lower X-ray dose than CT examinations.

Evaluation of the bone union of the grafted bone is based on the continuity between the grafted bone and the original bone and on the reduction in radiolucent lines. As doctors found evaluation difficult due to the strong enhancement of the FBP image in Fig.3 D), the shift-and-add method image in Fig.3 C1) was used subsequently. The shift-and-add method image in Fig.3 C2) was taken 1 year and 2 months after surgery. It shows that bone union is almost complete.

Conclusions

Fig.4 compares CT and tomosynthesis images. For a CT examination in which radiography is conducted while rotating the body axis, the significant metal artifacts centered on the metal and the beam hardening occurring between metals affect the raw images. Blurring occurs along the path of the X-ray tube during tomography. However, as the images are two dimensional, the effects of the artifacts are less than with CT. Low-artifact images can be achieved by selecting shift-and-add method images or FBP images according to the aim of the examination.

CT is superior in some aspects, as it allows flexible image reconstruction and produces 3D images. However, due to concerns about X-ray exposure from radiodiagnosis since the publication of a paper in the Lancet in 2004, CT examinations have been classified in the highest exposure class of all radiodiagnostic techniques, with a tissue-absorbed dose of between 10 and 100 mGy. As tomosynthesis requires fewer images than CT, the exposure dose should be lower.

Examining these topics and efficiently applying digital image technologies to take even better images in the future should make tomosynthesis an effective means of post-operative follow-up.

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Figure 3: a) X-P               b) CT image                  c1) Shift and add method  c2) Shift and add method  d) FBP image  

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Figure 4: Comparison of CT and Tomosynthesis
Clinical care focus: infection control

Nosocomial pneumonia: risk factors, rates and trends

ARTICLE BY M M ABDEL-FATTAH
Epidemiology and Research Unit, Department of Preventive Medicine, Al-Hada Armed Forces Hospital, Taif, Saudi Arabia

Abstract: This study aimed to estimate the rate of and risk factors for nosocomial pneumonia of patients admitted to hospitals in Taif, Saudi Arabia. A case-control study was conducted of 211 discharged patients with confirmed pneumonia and 633 controls without pneumonia and a review was made of hospital records during 1999–2003. Multiple logistic regression showed that duration of hospital stay, unit of admission, chronic obstructive pulmonary diseases, coma, nasogastric tube, endotracheal tube, debilitating diseases and mechanical ventilation were independently associated with increased risk of pneumonia. The mean incidence of overall nosocomial infection in the period 1999–2003 was 3 per 100 discharged patients, while the mean incidence of nosocomial pneumonia was 0.88.

Nosocomial infection is becoming recognized as a major problem in developing countries. As well as its contribution to the morbidity and mortality of hospitalized patients, nosocomial infection is an economic burden due to the extra days of hospitalization and the more expensive therapy that is required. Up to 10% of all hospital patients develop nosocomial infections. Nosocomial pneumonia (NP) is a significant cause of morbidity and mortality among hospitalized patients. It is defined as pneumonia that was neither present nor incubating when the patient was admitted to the hospital. NP is the 2nd most common nosocomial infection in the United States and worldwide and is the most frequent nosocomial infection in intensive care units (ICUs). In recent studies, the incidence was reported to range from 6.0% to 27%. Patients with NP tend to stay 1 to 2 weeks longer in hospital than those without NP and result in higher costs. Prevention and management of such infections require an intimate knowledge of the epidemiology of the infection, including risk factors. Hospital infection control programmes can prevent 33% of nosocomial infections including pneumonia.

Studies on NP have mainly been reported from the United States and European countries, and studies from around the world are scarce. This study aimed to estimate the rates of overall nosocomial and pneumonia and their linear trends over the last 5 years (1999–2003) and to determine the potential risk factors for NP of patients admitted to Taif hospitals, in order to establish a plan for reducing the incidence of NP in these hospitals.

Methods
To fulfill the objectives of this study, 2 strategies were adopted: a case-control study to determine the risk factors for NP and a record review to calculate NP rates.

Case-control study
The case-control study was carried out between April 2003 and March 2005 at Al-Hada (351 beds), Al-Rehab (100 beds) and Prince Sultan (50 beds) military hospitals, Taif, Saudi Arabia. These 3 hospitals are under the same administrative programme and serve military people and their families. All patients hospitalized at these hospitals for at least 72 hours throughout the study period were considered eligible for the study. Among these, patients proven to have pneumonia were considered cases. Nosocomial pneumonia was considered when new and persistent (more than 48 hours) pulmonary infiltrates not otherwise explained appeared on chest radiographs. Moreover, at least 2 of the following criteria were also required:

- fever > 38 ºC;
- peripheral leukocyte count > 10 000/mm³;
- purulent endotracheal secretions with a Gram stain showing 1 or more types of bacteria.

Ventilator-associated pneumonia was considered when the onset of pneumonia was after 48 hours of mechanical ventilation. After exclusion of patients who did not fulfill the eligibility criteria, 3 controls for each case were enrolled by simple random selection from a list of patients hospitalized for more than 72 hours who did not develop any type of nosocomial infections. Nosocomial infections were diagnosed based on the Centers for Disease Control and Prevention criteria for diagnosis of nosocomial infections. For all participants (cases and controls), the following information was collected: age, sex, unit of admission, smoking history, nasogastric tube, endotracheal tube, mechanical ventilation, history of surgery (head, neck, or thoracoabdominal), chronic obstructive pulmonary diseases (COPD), coma, diabetes mellitus, history of immunosuppressive drug intake, inappropriate use of antibiotics, history of debilitating diseases (cancer, liver failure, uraemia) as well as duration of hospital stay. Appropriate antibiotic therapy included the administration of at least 1 empirical antibiotic with in vitro activity against the bacterial pathogens isolated from the patient’s respiratory secretions, as well as from...
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blood and pleural fluid when applicable\(^1\),\(^2\).

The data from the patients’ records were collected during the hospital stay of the patients by a trained nosocomial infection surveillance team from the Department of Preventive Medicine.

**Record review**

Hospital records, providing the number of hospitalized patients and the numbers of nosocomial infections (crude and stepwise) per month were reviewed. The overall annual nosocomial infection rate and NP rates were calculated during the period 1999–2003 by dividing the total number of nosocomial infections (crude and pneumonia) pooled throughout all months by the total number of hospital patients discharged including hospital deaths (>100). Critically ill patients (those admitted to the medical, surgical, neonatal or burns ICUs), were treated as a separate group. Overall nosocomial infection and NP rates were calculated for this particular group.

**Statistical analysis**

Statistical analysis was carried out with SPSS, version 11.0. A linear trend was applied to search for evidence of change in the incidence rate of overall nosocomial and pneumonia over time. Age, sex, duration of stay in hospitals, unit of admission, smoking, nasogastric tube, endotracheal tube, mechanical ventilation, surgery, COPD, coma, diabetes mellitus, underlying debilitating diseases and history of immunosuppressive drugs were treated as categorical variables. The crude measure of association between single putative risk factors and NP was expressed as the odds ratio (OR) with 95% confidence interval (95% CI). Multiple associations were evaluated in multiple logistic regression models based on the backward stepwise selection. This process allowed the estimation of the strength of the association between each independent variable and the dependent variable, taking into account the potential confounding effects of the other independent variables. The covariates were removed from the model if the likelihood estimates had a probability > 0.10. Each category of the predictor variables was contrasted with the initial model if the likelihood estimates had a probability > 0.10. The results of univariate analysis of the studied risk factors for NP are summarized in Table 3. Nosocomial pneumonia was significantly associated with stay in hospital for > 3 weeks as opposed to < 1 week (OR = 3.14; 95% CI: 1.71–5.77). Mechanical ventilation history was strongly and positively related to NP (OR = 4.60; 95% CI: 1.24–16.29). The presence of underlying debilitating disease and COPD were also significantly associated with an increased NP risk (OR = 3.96; 95% CI: 2.38–6.59 and OR = 3.08; 95% CI: 1.91–4.97). Smoking, history of smoking, history of immunosuppressive drugs, presence of diabetes mellitus, as well as history of surgery were not independently associated with NP.

**Results**

A total of 211 discharged patients with NP and 633 controls without NP were recruited. Their baseline characteristics (age and sex) are reported in Table 1. The age of cases ranged from 2 days to 91 years [mean 42.3 (standard deviation 29.3) years; median 47.0 years], while for controls it ranged from 2 days to 87 years [mean 40.7 (SD 29.4) years; median 46.0 years]. The difference between the 2 groups was not statistically significant (P > 0.05). Females represented 43.3% and 45.2% of cases and controls, with no significant difference (P > 0.05). The results of univariate analysis of risk factors for NP are summarized in Table 2. Patients aged > 65 years were more liable to develop NP compared with those aged ≤ 15 years (OR = 5.16; 95% CI: 1.53–16.88). Nosocomial pneumonia was significantly associated with stay in hospital > 3 weeks as opposed to < 1 week (OR = 5.44; 95% CI: 3.14–9.42). Patients admitted to surgical, ICU or burns units were more liable to develop NP than those admitted to medical units (OR = 2.18; 95% CI: 1.39–3.23; OR = 3.96; 95% CI: 2.38–6.59; and OR = 3.09; 95% CI: 1.77–5.36 respectively). Presence of nasogastric tube and insertion of endotracheal tube were also associated with NP. Patients with a history of presence of nasogastric tube had an increased risk of NP as compared with patients with no history of nasogastric tube (OR = 2.35; 95% CI: 1.45–3.80). Patients with a history of insertion of endotracheal tube had a 3-fold risk as opposed to those with no history of endotracheal tube (OR = 3.14; 95% CI: 1.71–5.77). Mechanical ventilation history was strongly and positively related to NP (OR = 6.69; 95% CI: 4.40–10.19). The presence of underlying debilitating disease and COPD were also significantly associated with an increased NP risk (OR = 3.06; 95% CI: 1.91–4.97 and OR = 3.52; 95% CI: 1.15–10.30 respectively). Comorbid patients had a 4-fold increased risk of NP (OR = 4.60; 95% CI: 1.14–19.59). History of inappropriate use of antibiotics was associated with a higher risk of NP (OR = 1.75; 95% CI: 1.02–2.96). Patient’s sex, history of smoking, history of immunosuppressive drugs, presence of diabetes mellitus, as well as history of surgery were not independently associated with NP.

The results of multivariate logistic regression analysis of the studied risk factors for NP are summarized in Table 3. Nosocomial pneumonia was significantly associated with stay in hospital for > 3 weeks as opposed to < 1 week (OR = 2.19; 95% CI: 1.24–3.74). Regarding unit of admission, patients admitted to the ICU or burns unit were more liable to develop NP than those admitted to medical units (OR = 2.73; 95% CI: 1.68–4.01 and OR = 3.06; 95% CI: 1.74–4.13 respectively). Presence of nosocomial tube and insertion of endotracheal tube were associated with NP. Patients with history of presence of NG tube had an increased risk of NP as compared to patients with no history of NG tube (OR = 2.18; 95% CI: 1.22–3.84). Patients with history of insertion of endotracheal tube had a 3-fold risk as opposed to those with no history of insertion of endotracheal tube (OR = 3.01; 95% CI: 1.87–4.21). Mechanical ventilation history was strongly and positively related to NP (OR = 6.29; 95% CI: 1.24–3.09). The presence of underlying debilitating disease and COPD were also significantly associated with an increased NP risk (OR = 3.17; 95% CI: 1.29–8.18 and OR = 2.96; 95% CI: 1.98–4.10 respectively). Comorbid patients had a 3-fold increased risk of NP (OR = 3.99; 95% CI: 2.87–7.03). Age, sex, history of smoking, history of immunosuppressive drugs and inappropriate use of antibiotics.
Clinical care focus: infection control

**Table 2: Risk factors for nosocomial pneumonia from the univariate analysis (211 cases and 633 controls)**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>No. of cases/ controls</th>
<th>Crude OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 15</td>
<td>3</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>16-45</td>
<td>53/162</td>
<td>1.34</td>
<td>0.85-2.21</td>
</tr>
<tr>
<td>≥ 65</td>
<td>80/182</td>
<td>1.80</td>
<td>1.13-3.88*</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>107/347</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>104/286</td>
<td>1.18</td>
<td>0.85-1.63</td>
</tr>
<tr>
<td>Duration of stay in hospitals (weeks)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1</td>
<td>125/403</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>44/152</td>
<td>1.05</td>
<td>0.70-1.58</td>
</tr>
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<td>&gt; 3</td>
<td>42/218</td>
<td>5.44</td>
<td>3.14-9.42*</td>
</tr>
<tr>
<td>Unit of admission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>78/369</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Surgical</td>
<td>50/110</td>
<td>2.13</td>
<td>1.39-3.32*</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>41/96</td>
<td>3.96</td>
<td>2.38-6.59*</td>
</tr>
<tr>
<td>Burns</td>
<td>30/46</td>
<td>3.09</td>
<td>1.77-5.36*</td>
</tr>
<tr>
<td>Other</td>
<td>12/59</td>
<td>0.96</td>
<td>0.47-1.95</td>
</tr>
<tr>
<td>Smoking</td>
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<tr>
<td>No</td>
<td>166/515</td>
<td>1.0</td>
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<tr>
<td>Yes</td>
<td>45/118</td>
<td>1.18</td>
<td>0.79-1.77</td>
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<td>Inappropriate use of antibiotics</td>
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<tr>
<td>No</td>
<td>185/586</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>26/47</td>
<td>1.73</td>
<td>1.02-2.99*</td>
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<tr>
<td>Nasogastric tube</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>175/582</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>36/31</td>
<td>2.35</td>
<td>1.45-3.80*</td>
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<tr>
<td>Endotracheal tube</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>166/607</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>25/26</td>
<td>3.14</td>
<td>1.71-5.77*</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>133/582</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>78/51</td>
<td>6.69</td>
<td>4.40-10.19*</td>
</tr>
<tr>
<td>Surgery</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>204/517</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>7/18</td>
<td>1.32</td>
<td>0.49-3.48</td>
</tr>
<tr>
<td>Coma</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>205/629</td>
<td>1.0</td>
<td></td>
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<tr>
<td>Yes</td>
<td>6/4</td>
<td>4.60</td>
<td>1.14-19.59*</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>203/626</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>8/7</td>
<td>3.52</td>
<td>1.15-10.93*</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>147/470</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>64/463</td>
<td>1.26</td>
<td>0.88-1.79</td>
</tr>
<tr>
<td>Underlying debilitating disease</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>170/587</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>41/46</td>
<td>3.08</td>
<td>1.91-4.97*</td>
</tr>
<tr>
<td>Immunosuppressive drugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>196/612</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13/32</td>
<td>1.92</td>
<td>0.89-4.09</td>
</tr>
</tbody>
</table>

*Reference category.
1 Head, neck, thoracabdominal.
2 Cancer, liver failure, uraemia.
3 P < 0.05.
4 OR = odds ratio; CI = confidence interval.

**Table 3: Risk factors for nosocomial pneumonia from the multivariate analysis**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Adjusted OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of stay in hospitals (weeks)</td>
<td>1.0</td>
<td>0.60-2.16</td>
</tr>
<tr>
<td>1-3</td>
<td>2.38</td>
<td>1.24-4.69</td>
</tr>
<tr>
<td>&gt; 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit of admission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Surgical</td>
<td>1.91</td>
<td>0.96-4.01</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>2.73</td>
<td>1.66-4.61*</td>
</tr>
<tr>
<td>Burns</td>
<td>3.05</td>
<td>1.76-6.39*</td>
</tr>
<tr>
<td>Others</td>
<td>1.36</td>
<td>0.71-2.52</td>
</tr>
<tr>
<td>Nasogastric tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2.18</td>
<td>1.22-3.14*</td>
</tr>
<tr>
<td>Endotracheal tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>1.78-6.21*</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.67</td>
<td>2.22-9.52*</td>
</tr>
<tr>
<td>Yes</td>
<td>2.99</td>
<td>2.87-17.03*</td>
</tr>
<tr>
<td>Underlying debilitating disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>2.96-14.12*</td>
</tr>
<tr>
<td>Yes</td>
<td>3.11</td>
<td>1.29-8.18*</td>
</tr>
</tbody>
</table>

*P < 0.05.
1 Reference category.
2 Cancer, liver failure, uraemia.
3 Age and history of prolonged inappropriate use of antibiotics were removed from the final model.

**Table 2: Risk factors for nosocomial pneumonia from the univariate analysis (211 cases and 633 controls)**

diabetes mellitus, as well as history of surgery were not independently associated with NP. The incidence of overall nosocomial infection during the study period (1999–2003) ranged from 2.1 to 3.5 per 100 discharged patients with a mean of 3.0, while the incidence of NP ranged from 0.6 to 1.1 per 100 discharged patients with a mean of 0.88 with no significant trend (P > 0.05) (Table 4). NP represented approximately 30.9% of overall nosocomial infection during the study period. Regarding critically ill patients as a separate group, the mean overall nosocomial infection and NP rates were 15.42 and 8.0 per 100 patients respectively throughout the study period (Table 4). There was an increasing trend in the incidence of NP and in the ratio of NP to total nosocomial infections during the entire study period (P < 0.05). NP represented around half of overall nosocomial infections (51.7%).

**Discussion**

Hospital-acquired pneumonia represents a significant impairment in the quality of health care. The reported incidence of NP in ICUs varies across different studies, which may be explained by the presence of different populations with varying ages, underlying diseases and other associated risk factors. Incidence ranges from...
New Oxoid Brilliance™ MRSA Agar is a selective chromogenic medium that permits the growth and differentiation of MRSA colonies on a single culture plate allowing the accurate isolation and detection of MRSA in just 18-24 hours. The medium is quick and easy to use, providing a reliable and cost effective method for MRSA screening in the hospital setting.

- Results after only 18 hours
- Direct inoculation from swab, isolate or suspension
- Quick and easy screening test, ready-to-use plates
- Distinctive denim blue colonies – MRSA positive
- Dramatically reduces false positive rates compared to other media, minimising confirmatory testing
- The highest Positive Predictive Value and Negative Predictive Value available for the chromogenic screening of MRSA:
  - PPV 98.1%
  - NPV 95.2%

Routine screening of patients for MRSA is one of the measures identified as fundamental in the fight against hospital acquired MRSA infections. As a result, many hospitals are now screening new admissions routinely. Among them in the UK are the Royal Berkshire NHS Foundation Trust and Heathenwood and Wexham Park Hospitals NHS Foundation Trust.

Reporting Results A Day Earlier Than Before

The Royal Berkshire NHS Foundation Trust screens approximately 250 patients per day for MRSA prior to surgery and upon emergency admission. They particularly like Oxoid Brilliance MRSA Agar as it is validated for a single 18-24 hour incubation. MRSA colonies are easily identified as they appear a distinct blue colour which stands out easily against the cream background of the medium. And, with no need to re-incubate, staff only need to look at the plate once.

The laboratory’s screening protocol requires two swabs from each patient (nose and throat). These are used to inoculate one plate per patient and the combined growth is examined. Presumptive positive colonies are confirmed using latex agglutination and a provisional, electronic report is released in just 18-24 hours. Further confirmation and antibiotic susceptibility tests are then performed on positives and a full report can be delivered the following day. Brilliance MRSA Agar allows reporting a day earlier than previously which is seen as a great advantage for infection control teams as it allows them to identify infection risk factors sooner. They can also use the information to assist in bed management, identifying whether the patient needs isolation or cohorting. Initiating these measures after the provisional report helps to stop the spread of MRSA at an earlier stage.

Easy to Use, Reliable and Time Saving

The Microbiology Department at the Heathenwood and Wexham Park Hospitals NHS Foundation Trust has been using Brilliance MRSA Agar for over 18 months. It gives them a turnaround time of 18-24 hours compared to 48 hours with other products.

Brilliance MRSA Agar is used for screening all new admissions, weekly screens and pre-admission clinics. One plate per patient is prepared and examined for growth. Where there are positives, these are picked directly for further identification and sensitivity testing.

The department finds this efficient method is extremely easy to perform which allows better use of staff. Reporting of results – whether positive or negative - within 18-24 hours also allows the infection control teams to act rapidly.

To find out more about how Brilliance MRSA Agar can make a difference in your hospital please contact Val kane@thermo Fisher.com or visit www.oxoid.com

* patient pending

References:
1. Data on file at Oxoid.
2. FDA consumer update - results at 24 hours

New Oxoid Brilliance™ MRSA Agar is sold as Rapid Spectra™ MRSA in the USA.
6.8% to 27%\(^6,15\). In this study it was 8%. Independent risk factors associated with NP included prolonged hospital stay, endotracheal tube, nasogastric tube, mechanical ventilation, underlying debilitating diseases, coma and COPD. Those risk factors could prove useful in identifying patients at high risk for NP as well as in developing preventive measures such as avoiding unnecessary nasogastric feeding or endotracheal intubations. 

Mechanical ventilation increases the risk of NP 3- to 10-fold\(^2-11\). Generally, the duration of mechanical ventilation increases the risk. Cook et al. reported that the rate of ventilator-associated pneumonia increased 2% per day in the 1st week of ventilation, 2% per day in the 2nd week, and 1% per day in the 3rd week\(^23,27\). In our study, patients on mechanical ventilation had a 6-fold higher risk for developing NP than the non-ventilated patients. Consequently, the use of noninvasive mechanical ventilation should be preferred whenever possible since it has lower rates of nosocomial infections\(^6\).

Coma was described as another important risk factor for NP. In these patients, local defense mechanisms of the respiratory airway are altered, allowing microorganisms to better attach to and colonize the mucosal surface. Furthermore, depression of the level of consciousness significantly increases the chance of aspiration and can result in development of NP\(^6\). In the current study, comatose patients had a 4-fold increased risk of NP.

As Gram-negative bacteria are documented to be the most common causative agents of NP\(^6\), prior antibiotic therapy and COPD (feeding to colonization with Gram-negative aerobic pathogens) were reported to be risk factors for the development of NP\(^2,12\). In our patient population, univariate analysis suggested that previous prolonged antibiotic treatment and COPD increased the risk of pneumonia, but only COPD was an independent risk factor in the multivariate analysis. Furthermore, the presence of a nasogastric tube was found to be a risk factor in our study population. NG tubes impair the function of the gastroesophageal sphincter and increase the risk of masticatory anaerobes, oropharyngeal colonization and reflux, all of which may lead to migration of bacteria\(^6\). However, to reduce the risk of NP, it is important to avoid unnecessary enteral nutrition\(^6\). The highest rates of NP were observed in ICUs, which are also the units in which the most severely ill patients are treated and in which the highest mortality rates are observed. Similar findings were found in another study\(^10\). In the literature, the insertion of an endotracheal tube is described as a significant risk factor for NP. Bronchial colonization during the procedure and prolonged continuation of sedation after the procedure will further increase the occurrence of NP\(^7\), which is what was seen in the current study. Patients with endotracheal tube had a 3-fold increased risk of NP. In accordance with our findings, numerous studies have demonstrated that severe underlying illness predisposes pneumonia\(^2,27\).

In conclusion, pneumonia comprises approximately one-third of nosocomial infections in our hospitals in Saudi Arabia. To reduce the incidence of NP, it is important to take into consideration the risk factors for NP that can be managed, and all those involved in hospital management need to set practical and effective guidelines for prevention of nosocomial infection.\(^\) 

Acknowledgements

The author would like to extend his thanks and appreciation of help to the Programme Directors, Al-Hada and Taif Armed Forces Hospital, Kingdom of Saudi Arabia. I would also like to thank all members of the infection control team at Al-Hada Armed Forces Hospital for their support and advice.

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References

A rapid immunochromatographic test for the direct detection of *Legionella pneumophila* antigen in human urine samples

- Designed to detect both serogroups 1 and 6
- Excellent sensitivity and specificity
- Easy to use
- Room temperature storage

Pneumonia caused by *L. pneumophila* was first recognised in 1977 after an outbreak among attendees at the 1976 American Legion convention. Since then infection by *Legionella* spp. has been found to be an important cause of community-acquired and nosocomial pneumonia. 

*L. pneumophila* serogroup 1 is the most frequent among human isolates, followed by *L. pneumophila* serogroup 6 according to the frequency of isolation from clinical samples.

Pneumonia caused by *L. pneumophila* has no particular clinical features to distinguish it from other pneumonias. The use of Xpect Legionella allows early diagnosis and initiation of appropriate antibiotic therapy.

**Interpretation of Results**

- **Positive Test** (antigen present): A positive test is indicated by two black lines; one in the TEST region and one in the control (CTRL) region. A complete, black, clearly visible test band of any intensity should be interpreted as positive. A positive test indicates the presence of *L. pneumophila* serogroup 1 or 6 antigen in the sample.

- **Negative Result** (antigen not detected): A negative test is indicated by only one black line in the control (CTRL) region. A negative test indicates that *L. pneumophila* serogroup 1 and 6 antigens are absent or below the detection limit of the test.

**Reference**

References continued

Should randomized clinical trials be required for proton radiotherapy?

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Abstract: Recently, several articles have been published in the Journal of Clinical Oncology and other journals reviewing and commenting on the record of proton beam therapy, as well as an analysis including some critical commentary by Brada et al. All of these articles make the uncontested point that there are almost no randomized clinical trials (RCTs) comparing proton beam therapy with conventional x-ray therapy. We wish to address the issues of why this is, whether RCTs would be appropriate, and whether they are necessary before proton beam therapy is widely promulgated and reimbursed.

In brief, the arguments for the use of protons in radiation therapy are as follows. (1) Owing primarily to their depth dose characteristics (for each proton beam, virtually no dose is administered distal to the target volume and substantially less dose is administered than x-rays proximal to the target volume), the dose distributions that can be achieved with protons are in almost all cases superior to those possible with x-rays (with or without intensity modulation, which can be achieved with both modalities). There is generally between two to three times less energy deposited by protons to the uninvolved normal tissues outside the target volume (variously described as integral dose or the dose bath) as compared with the energy that x-rays deposit. (2) There is virtually no difference in tissue response per unit dose between protons of therapeutic energies as compared with x-rays, so that the only relevant differences are physical. (3) Radiation delivered to normal tissues causes damage to them, just as it does to tumors, and the severity of that damage increases with increasing dose.

Item (1) has been documented exhaustively in treatment planning studies. There is a large body of in vivo and in vitro evidence underpinning item (2). Item (3) is corroborated in countless clinical reports over many decades. These points are not contested by any of the authors cited above, nor, to our knowledge, by any critics of proton beam therapy. They are not speculations—they are demonstrated facts.

It is therefore hard to imagine how any objective person could avoid the conclusion that there is, at the very least, a high probability that protons can provide superior therapy to that possible with x-rays in almost all circumstances. It is primarily for this reason that the practitioners of proton beam therapy have found it ethically unacceptable to conduct RCTs comparing protons with x-rays. Such a comparison would not meet a central requirement for performing RCTs, namely that there be equipoise between the arms of the trial.

Brada et al base their opinions on what they understand to be the requirements of evidence-based medicine. In our opinion, the issue has much more to do with the implications of evidence-based medicine than it does with the clinical effectiveness of protons. In short, does evidence-based medicine require that, under all circumstances, positive RCTs are a precondition for the promulgation and reimbursement of new technologies? If it does, and if one accepted evidence-based medicine, so defined, as the sole basis for making medical decisions, then one would have no choice but to agree with the position taken by Brada et al and others. However, we find it impossible to believe that unethical clinical studies could be considered to be a prerequisite to the adoption of a medical therapy. It must surely be the case that there are circumstances under which even the most dedicated advocate of evidence-based medicine would agree that RCTs would be improper. In deciding whether the arms of a trial meet the equipoise standard, one can only rely on informed judgment. It is our argument that informed judgment leads to the conclusion that proton beam therapy is precisely such a circumstance.

Advocates of RCTs are prone to state that, although there may be good arguments for the superiority of one arm, one does “know” that there is an advantage. In addition, to justify the conduct of trials that seem not to be in equipoise, they cite trials in which the outcome was the reverse of what was expected. Taking this argument to its extreme, one would have to conclude that there is effectively no clinical knowledge except that learned from RCTs. But this is an untenable position. Knowledge is not a dichotomous quality. We know things with varying levels of confidence. Even when RCTs are available, rarely do they provide all the information that is needed to care most effectively for the patient. We make informed evaluations of the level of confidence one has in any given judgment (for example, virtually all informed persons judge that the validity of the above-listed points is established with extremely high confidence), and we must base
Can anyone seriously believe that, if protons were cheaper than x-rays, there would be similar objections raised as to their immediate and widespread use? This seemingly rigorous academic discussion, in reality, is driven by the uncontested fact that protons are more expensive than x-rays.

Regarding the issue of cost, the additional expense of protons is not so great as is often imagined, and there is good reason to think that it will come down. Goitein and Jermann have analyzed the cost of proton beam therapy and high-technology x-ray therapy. They conclude that, with some foreseeable improvements, the ratio of costs is likely to be about 1.7. Although this represents an appreciable cost increment, it is substantially less than the costs of, for example, some expensive systemic therapies. At best, the benefit these expensive systemic therapies is probably no more than that of protons, and such therapies often offer not improved local control or survival, but only a modest extension of the duration of palliation. Moreover, the recent surge of interest in acquiring proton beam facilities will almost certainly reduce the costs of proton therapy equipment through free-market competition, the design of smaller and less expensive facilities, and a normalization of reimbursement rates based on the real costs of proton treatments. In our professional lives, we have lived to see almost identical arguments being made regarding new technologies, including the introduction of cobalt-60 teletherapy machines, the use of treatment simulators, the use of high-energy linear accelerators, the use of computed tomography, and so forth. We look back now on those arguments and wonder at the poor judgment that was evidenced then, and feel sure that history will judge the current controversy in the same manner.

We doubt that many of us, while healthy, would agree to receive, for example, 25 Gy to a large fraction of our brain or abdomen in exchange for some thousands of dollars, with no known or credibly hypothesized medical benefit. If we would not, how can we ask our sick patients to do so? Once proton beam therapy has become clinically available, is not the burden of proof on conventional x-ray therapy? Should not its advocates have to demonstrate that the cost savings achieved by using x-rays are not accompanied by undesirable additional morbidity? Do the users of x-ray therapy have the evidence to support such a claim?

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Final approval of manuscript: Michael Goitein, James D Cox

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Stock Ownership: None Honors: None Research Funding: None Expert Testimony: None Other Remuneration: None.
Clinical care: patient handling

Comparison of two self-reported measures of physical work demands in hospital personnel: a cross-sectional study

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Abstract: Background – Low back pain (LBP) is a frequent health complaint among health care personnel. Several work tasks and working postures are associated with an increased risk of LBP. The aim of this study was to compare two self-reported measures of physical demands and their association with LBP (the daily number of patient handling tasks and Hollmann’s physical load index).

Methods – A questionnaire was distributed to 535 hospital employees in a psychiatric and an orthopedic ward in a Danish hospital. Of these 411 (77%) filled in and returned the questionnaire. Only the 373 respondents who had non-missing values on both measures of physical demands were included in the analyses. The distribution of physical demands in different job groups and wards are presented, variance analysis models are employed, and logistic regression analysis is used to analyze the association between measures of physical demands and LBP.

Results – In combination, hospital ward and job category explained 56.6% and 23.3% of the variance in the self-reported physical demands measured as the daily number of patient handling tasks and as the score on the physical load index, respectively. When comparing the 6% with the highest exposure the prevalence odds ratio (POR) for LBP was 5.38 (95% CI 2.03–14.29) in the group performing more than 10 patient handling tasks per day and 2.29 (95% CI 0.93–5.66) in the group with the highest score on the physical load index.

Conclusion – In specialized hospital wards the daily number of patient handling tasks seems to be a more feasible measure of exposure when assessing the risk of LBP compared to more advanced measures of physical load on the lower lumbar spine.

Musculoskeletal pain is a common health complaint in the general population and a significant part of all musculoskeletal pain is related to unspecific low back pain (LBP). It is estimated that 44–54% of the 30–60 year old Nordic population have experienced back pain at least once during a one-year period. It is generally found that LBP is more frequent among nursing personnel compared to many other occupational groups.

Several physical exposures in the working environment have been linked to an increased risk of LBP, and a number of these are present in the working environment of hospital personnel. In a report by the National Research Council and Institute of Medicine (US) it is concluded that there is a clear relationship between back disorders and physical load imposed by lifting and/or carrying loads, frequent bending and twisting, physically heavy work, and whole-body vibration.

The majority of studies in this area are based on self-reported questionnaire data. Despite methodological flaws, self-reported exposure measurement has several advantages compared to technical exposure measurement and laboratory studies. The feasibility of questionnaire-based instruments is generally high in epidemiological studies and several instruments have been developed in order to measure the perceived physical demands in the working environment. These instruments can serve to unveil risk factors for negative health outcomes and to identify high risk jobs and work tasks.

The physical demands in the hospital sector can be measured with a generic questionnaire including several general questions on the relative frequency of different working postures and carrying of loads or by means of a single question related to the frequency of one specific but complex work tasks, e.g. the number of patient handling tasks during a normal work day.

Since both generic questionnaires with several items as well as specific questions are widely used, the overall aim of this study was to compare these two types of measures in a group of hospital personnel. First, we wanted to compare the accordance between the two types of self-reported exposure measurements and more objective measures of exposure as type of hospital ward and job category. Secondly, we wanted to investigate and compare the associations between each of the two types of self-reported exposure measurements and the occurrence of LBP.

The instrument based on several items was expected to imply less non-differential misclassification than a single item. In general, non-differential misclassification would lead to a bias toward the null value. Compared to subjective appraisal of the relative frequency of work postures, asking specifically about the number of patient handling tasks was expected to lead to less differential misclassification. This may also yield smaller risk estimate.

Therefore, we hypothesized that the association between LBP and a generic questionnaire with several items including subjective
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appraisals would be stronger than the association between LBP and a specific question on number of patient handling tasks.

**Methods**

**Study population**

A questionnaire based cross sectional study was carried out among hospital staff in the orthopedic and psychiatric ward in a Copenhagen hospital. These two wards are included in the study because of their preponderance of working environment problems. Permanently employed personnel engaged in nursing, treatment or counselling of patients were included in the study. Personnel on sick leave or maternity leave or employed in secretarial posts were excluded. A total of 535 employees were eligible for inclusion and were mailed a questionnaire. Of these 411 (77%) filled in and returned the questionnaire. The gender and age distribution did not differ significantly between respondents and non-respondents (data not shown).

Only 373 respondents who had non-missing values on both measures of physical demands were included in the analyses. The study population consisted of registered nurses (n = 128); other nursing staff (n = 114); physicians and psychologist (n = 75);physio- and ergotherapists (n = 33); and other hospital personnel (n = 25); i.e. social counselors, hospital orderlies, therapists and other clinical personnel. The distribution of personal characteristics and seniority in the study population is shown in Table 1.

**Questionnaire**

The questionnaire contained questions on work-related physical and psychosocial demands, musculoskeletal pain, individual characteristics and lifestyle factors.

**Low back pain (LBP)**

The questions on LBP were derived from the Standardised Nordic Questionnaire for the Analysis of Musculoskeletal Symptoms12. In this study the one-year prevalence of LBP was used as outcome. Cases were defined as participants with pain sometimes, often or very often during the last 12 months, while non-cases were defined as participants who reported pain seldom or never during the same period. This case-definition has previously been used13,14.

**Work-related physical demands**

As an example of specific, single-item exposure measurement, the participants were asked about the number of patient handling tasks during a normal workday categorized as never, seldom, 1–2 times per day, 3–10 times per day, and more than 10 times per day. Answers were subsequently divided into three categories: 0–2 times per day, 3–10 times per day and more than 10 times per day. The generic instrument used in this study was Hollmann’s physical load index. The index was calculated as the weighted sum of the scores of 15 items describing the frequency of different work positions combined with the lifting of light to heavy objects. The weight of each item depended on estimated compressive forces on the lower lumbar spine from the posture given by that item. A score between 0 and 56.2 was calculated for each participant. The physical load index was categorized in three groups to yield a variable with a marginal distribution similar to that of the question on daily patient handling tasks. This enables comparison of the two instruments.
association between LBP and the daily number of patient handling tasks or physical load index, respectively, was analyzed in a multivariable regression model. All other variables which were significantly associated with the outcome in the univariable analyses on a 5%-level were controlled for in the adjusted analyses.

Results

The one-year prevalence of LBP was 39% in both nurses and other hospital personnel, 23% in physicians/psychologists, 33% in physio- and ergotherapists and 98% in other nursing staff.

Physical demands in the hospital sector as measured by a specific question on the daily number of patient handling tasks and the generic questions on working postures and lifting (the physical load index) are presented in Table 2 and 3. The Spearman correlation coefficient between the two measures of physical demands is 0.596, and the number of daily patient handling tasks explained 33.1% of the total variance in the physical load index. The Spearman correlation coefficient between the psychosocial demands and the two measures of physical demands ranged between -0.330 and 0.156, and the correlations between the five measures of psychosocial demands ranged between -0.555 and 0.364.

Both types of exposure measurement of physical demands reflected the expected differences between job categories and at the same time distinguished between differences in physical demands between personnel within the same job category working in different wards. Of course, since the physical load index also quantifies physical demands apart from patient handling this instrument is preferable in job groups where the frequency of patient handling is low in order to be able to differentiate between groups as regards physical demands.

We found that, in combination, job category and ward explained 23.3% of the variance in the trichotomized physical load index and 56.3% of the variance in the trichotomized number of patient handling tasks. Thus, in this population patient handling tasks are more related to job title and ward than the physical load index.

The Spearman correlation coefficient between the psychosocial demands and the two measures of physical demands ranged between -0.330 and 0.156, and the correlations between the five measures of psychosocial demands ranged between -0.555 and 0.364. In the adjusted analyses the association between LBP and the number of daily patient handling tasks remained significant with POR's almost doubling between each exposure level, indicating a dose-response relationship between LBP and frequency of patient handling (Table 5). A similar association with LBP was also found for the physical load index although with a smaller increase in the POR between exposure levels.

These results demonstrate that both generic and specific measurements of physical demands in hospital work are significantly associated with an increased prevalence of LBP. However, when comparing the 6% of the population with the highest physical demands, as measured by each of the instruments, there is evidence that the relative risk of LBP when performing more than 10 daily patient handling tasks is higher than the risk in the high exposure group when using the physical load index. This is also supported by the p-values for each estimate.

Discussion

In this cross-sectional study the one-year prevalence of LBP was associated with work-related physical demands among hospital personnel. The association was strongest when employing the daily number of patient handling tasks as a measure of exposure to physical demands. Although the physical load index is constructed as a measure of the added compressive forces on the lower lumbar spine during a normal work day this index turned out to be less exact in capturing the physical demands that increased the risk of reporting LBP. One reason could be that each patient

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<td>Registered nurses</td>
<td>14.6% 70.8% 14.6%</td>
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<td>Other nursing staff</td>
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* Table 2: Number of daily patient handling tasks in different job categories and wards; percentages are presented

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* Table 3: Physical load index score in different job categories and wards; percentages are presented
handling situation implies a high risk of accidents due to sudden, unexpected loading. The physical load index, however, was a more sensitive measure of work-related physical demands in job groups and wards where the frequency of patient handling tasks was low.

Because of the high correlation between the two types variables measuring physical demands, the estimate for the association between patient handling tasks and LBP will also to some extent reflect the exposure to awkward postures and vice versa. Several other studies have shown a relationship between patient lifting frequency and low back problems. According to Jensen, each patient handling involves an increased risk of a back injury especially when something unexpected happens (e.g. the patient slips) and in a meta-analysis of 6 epidemiologic studies the prevalence of low back problems among nursing personnel who frequently handled patients was 3.7% higher than the prevalence among personnel performing patient handling patients less frequently. In a prospective study of nurses aides the odds ratio for intense LBP was 1.63 when positioning patients in bed 5–9 times per day compared to zero times a day (the risk decreased when doing the same task 10 times or more per day). In another cross-sectional study, however, working for long periods with head, arms or body in awkward positions or working while bent or twisted at the waist were generally more strongly associated with low back problems among nursing personnel who frequently handled patients (OR 3.4–4.9) than physical demands which specifically involved patients (OR 2.0–2.8).

Also psychosocial factors are found to be of importance, especially in relation to the course of LBP from an acute to a chronic state, and to the degree of disability caused by LBP. The estimates of the association between physical demands and LBP have therefore been controlled for differences in psychosocial work factors. Including several job categories in the study population advantageously increased the contrast in exposure but did also enhance the risk of residual confounding. We did not control for job category in the adjusted analyses since job category is highly correlated with work-related demands and further adjustment would consequently weaken the study’s ability to investigate the effect of different physical exposure measurements. Also the employment of (only) two wards increased the risk of residual confounding since we were not able to control for e.g. dimensions of work culture at the two wards.

The cross-sectional study design has limitations related to selection bias in terms of the healthy worker effect. This tends to yield conservative estimates of the association between physical demands and LBP. However, we expect this bias to equally influence the estimates for both measures of physical demands. Moreover, we can not determine causal relationships between physical demands and LBP in this study. On the other hand, this study can provide basis for decisions regarding exposure measurement in large scale follow-up studies on causal risk factors for LBP in hospital personnel.

Differential misclassification could be a source of bias in the present study, yielding spurious associations between exposure and outcome. Results of studies of validity and reliability of self-assessed physical demands point into different directions. We assume that the number of patient handling tasks is a more “objective” measure which implies a lesser degree of individual interpretation than the frequency (in relative terms) of different working postures. We also found job category and ward to explain more of the variation in the daily patient handling than in the physical load index. Thus, the variable with the strongest association with LBP was also to a higher degree explained by more objective, though probably less precise, measures of exposure. These results indicate that differential misclassification between LBP cases and non-cases is not a major source of bias, even though differential misclassification can not unequivocally be ruled out.

Conclusion

This study shows that among hospital personnel the frequency of patient handling tasks seems to be more strongly associated with LBP than a generic instrument estimating the total mechanical load on the lower lumbar spine. A single question on frequency of patient handling tasks therefore has advantages as a screening...
instrument both for practical reasons (e.g. the risk of missing data when asking several questions) and because of accuracy. It can be hypothesized that if the physical challenge involved in each patient handling task is even more diversified depending on the varying capacity and cooperation of each client the frequency of patient handling will be too unspecific as a measure of exposure.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
KNN participated in the formulation of the study, performed the statistical analyses and drafted the manuscript. NF participated in the formulation of the study and choice of statistical methods and was responsible for the design of the questionnaire survey and data collection. KBC participated in the formulation of the study, choice of statistical methods, and performance of statistical analyses. JNJ participated in the description of background knowledge. FD was responsible for the design of the questionnaire survey and data collection. KBC participated in the formulation of the study, choice of statistical methods, and had the overall scientific responsibility. All authors critically read, revised and finally approved the manuscript.

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References


Ensuring optimum care temperature
with the Care Thermometer:
validation and use

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Abstract: The Care Thermometer is an easy-to-use, web-based, self-assessment tool, designed to provide an efficient and reliable overview of the present situation in two specific areas: the physical care load and prevention policy in a unit or facility. In short it provides a quick reading of the care “temperature”. The Care Thermometer allows the users to assess the current situation in their facility today, and, with regular use, it can help track progress over time. The Care Thermometer is a further step in the development of the TilThermometer©, a validated assessment tool (Knibbe & Friele, 1999).

Introduction: the Care Thermometer
Healthcare facilities implementing ergonomic policies in the nursing profession feel an increased need to monitor and fine tune their policies. They invest considerable effort and money in the implementation process. Management therefore will need data to monitor progress and promote further change. Currently their vision is often limited to data on sick leave and costs of injuries and compensation claims. Additional data might allow for a faster and more sensitive monitoring on a ward level and provide a means to tailor policies to the exact situation per ward.

For this purpose the Care Thermometer was developed and a further study is undertaken to validate the Care Thermometer. The Care Thermometer is originally based on the Dutch ‘TilThermometer©’ developed by Knibbe et al. in the Netherlands (Knibbe & Friele, 1999). The TilThermometer was adapted for all health care sectors, tested by focus groups and is currently used on a large, national scale on a regular basis. This tool is endorsed by unions, employers and the Health and Safety Inspectorate. Currently about 80% of all clients in geriatric care have been assessed with the TilThermometer. The tool is also widely used in other health care sectors in the Netherlands. These databases assist in the validation process of the Care Thermometer.

When compared to the TilThermometer, the Care Thermometer is more comprehensive as it specifies more sources of potential physical overexposure. It also explicitly covers issues related to quality of care, whereas the TilThermometer is primarily an occupational and ergonomic tool.

Exposure assessment and physical care load
The Care Thermometer focuses on the assessment of exposure. The reason for this is that research demonstrates a correlation between high levels of exposure to physical loads and the prevalence of musculoskeletal disorders. Therefore, exposure assessment is a sensitive and practical way of designing and evaluating a preventive policy. This holds especially true in nursing for exposure to:

- **dynamic loads**, such as lifting and transferring passive patients, and also to
- **static loads**, such as bending over a patient for prolonged periods during activities like wound care or washing and bathing.

The assessments from the Care Thermometer are also intended to be used to refine or design an effective injury prevention policy. Findings from the Care Thermometer can, for example, provide the basis for well-informed decisions on better allocation of equipment or provision of new equipment to ensure safe, high-quality care.

By using the Care Thermometer on a regular basis it is possible to monitor progress over time and redirect whenever and wherever necessary. Regular readings of the Care Thermometer for a specific unit or the facility will provide a good picture of the change in mobility levels, how this impacts the physical care load and if changes in equipment usage are necessary.

Assessment of patients
One of the most important starting points for the design of a preventive policy is an assessment of the type and amount of assistance patients require. In the Care Thermometer this is summarised in the word “physical care load”.

For the purpose of monitoring the physical care load, the Care Thermometer uses a five-level classification system ranging from completely independent (category A) to fully dependent (category E) patients. The assessment of mobility is based on the functional mobility level of patients, not the exact nature, or diagnosis, of their disease, impairment or disability. The first step is therefore to assess and classify all patients in this five-level system. Although it may be difficult to place some individual patients in one of the five groups, the general picture appears to be reliable enough to base policy decisions on.

Safety measures in place
The second basic element in the design of a policy is formed by the measures that are already taken or in place so carers can work safely.

The Care Thermometer assesses the presence of the different
types of equipment and relates this to the physical care load and the mobility level of the patients. The outcome will be an overview of the levels of care load risk involved in each activity and also per patient mobility level. The three levels of risk are symbolised by the colours red, yellow and green:

**Red risk level:** Transfer or activity is "unsuitable" for the carer/s. The assessment has revealed a high risk of physical overload during the transfer or activity when comparing equipment provision to patient mobility. A more detailed risk assessment should be undertaken and escalated as appropriate immediately. This may include involvement of your Moving and Handling Advisor or appropriate Clinical Manager.

**Yellow risk level:** Transfer or activity is "unsafe" for the carer/s. The assessment has revealed a medium risk of physical overload during the transfer or activity when comparing equipment provision to patient mobility. A risk assessment should be undertaken as soon as possible to ensure adequate controls are in place.

**Green risk level:** Transfer or activity is "safe" for the carer/s. The assessment has revealed a low risk of physical overload during the transfer or activity when comparing equipment provision to patient mobility and activities.

### Quality of care
Prevention and reduction of occupational risks is, of course, not only a matter of the right equipment. At least of equal importance is the maintenance and, if possible, improvement of mobility and independence within the patient population.

The Care Thermometer not only determines if the amount and type of equipment is adequate from a safety point of view, it also identifies if patient mobility and activity is stimulated or if too much assistance is given and there is a risk of rendering the patients passive.

### Activities Included in the Care Thermometer
The following care tasks were identified as the most pronounced potential occupational risks. For this reason they were included in the Care Thermometer:
1. repositioning in bed;
2. lateral transfers;
3. general transfers;
4. hygiene care in a sitting position;
5. showering in a supine position;
6. bathing;
7. transfers to/from bath;
8. care on the bed;
9. use of compression stockings (AES).

### Care Thermometer in practice
With information from the Care Thermometer, one can further refine or design a prevention policy. The results will provide clear leads to tailor the policy and prioritise steps in a policy or action plan. This may result, for example, in a sound factual basis for decisions on additional equipment or re-distribution of equipment. Over time, the Care Thermometer can be used to evaluate progress. By comparing new results with the ones from previous assessments, it is easy to follow changes in care load risk levels as well as quality of care.

### Validation process
As the claims of the Care Thermometer (CT) are obviously ambitious a validation study of the Care Thermometer is undertaken. This will provide an indication of the quality of the data gathered with the tool. In the validation process the following research questions will be answered:
1. Are the parameters of the CT complete?
2. Do these parameters actually measure what they intend to measure?
3. Does the CT produce valid and reliable results in real life conditions?
4. Are the parameters and the tool itself sensitive enough to highlight specific differences across health care sectors and across countries?

One of the options for validation-studies is to combine data gathered from different angles and measurement "sources" in order to determine the level of converging-validity. If the results of different sources converge, this can be considered as an indication of the validity. And, the other way around, a lack of convergence can pinpoint weaknesses in the validity of the tool. It will therefore need improvement. The results of the following three data sources ("triangulation") are currently being compared with the actual use and results of the Care Thermometer:
1. real life observations, quantitative and qualitative evaluation on the ward;
2. the use of the StaDyMeter;
3. the use of the RiskRadar.

Ad 1: The results will be compared with the results the facilities themselves collect on the Care Thermometer.
Ad 2: The StaDyMeter is a self-administered log used before in the validation process of the original TT and will now again provide relevant input and the option of comparing the results with the reference data collected in the validation process of the TT (Knibbe & Friele, 1999 and Knibbe et al. 2002-2007). This tool collects data on a ward or team level, is quantitatively oriented and is more detailed than the TTThermometer and the Care Thermometer.
Ad 3: The RiskRadar is a protocolized tool that analyses the exposure to physical load on an individual (nurse) level. It will not only assess the exposure itself quantitatively, but will also check for missed sources of overload and will also additionally for each of the sources found assess the level of physical load that nurses experience. This subjective experience is also important, not only because it is relevant in itself, but also as it may provide a source of bias in the data gathered with the Care Thermometer.

For the validation study four countries are included and for each country 4 facilities participate: two from long stay and nursing homes and two from acute care. After this process the results of these three sources will be combined and the differences and degree of convergence with the results of the Care Thermometer will be determined. This will lead to a final conclusion as to the validity of the Care Thermometer and also (directions for) possible adaptations that might improve its validity.

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### References

200 International Hospital Federation Reference Book 2008/2009